Assembly and Operation of the HEATHKIT by Daystrom

"MARAUDER" TRANSMITTER

MODEL HX-10

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SPECIFICATIONS

Types of Emission	CW, AM, FSK, SSB (upper or lower sideband).
Power Input	180 watts CW and FSK, 180 watts P.E.P SSB, 75 watts AM phone.
Power Output	100 watts nominal into 50 Ω, CW, FSK, and SSB, 25 watts AM.
Output Impedance	50 to 75 Ω, with not more than approximately 2 to 1 SWR.
Frequency Range (mc)	3.5 to 4.1; 6.9 to 7.5; 13.9 to 14.5; 20.9 to 21.5; 27.9 to 28.5; 28.5 to 29.1; 29.1 to 29.7.
Frequency Stability	Overall stability 100 cps after warmup.
Tuning Knob Ratio	Spinner type knob provides a tuning rate of approximately 10 kc per turn.
Carrier Suppression	50 db below peak output.
Unwanted Sideband Suppression	55 db below peak output.
Keying Characteristics	Grid Block Keying for full break-in CW provided by operating VOX from keyed tone.
Audio Input	High impedance microphone or phone patch.
Audio Frequency Response	400 to 3000 cps at ±3 db.
ALC	Control voltage applied to IF amplifier stage.
Front Panel Controls And Connectors	MODE Switch - CW, AM, FSK, LSB, USB. AUDIO GAIN. DRIVER TUNE. BAND SELECTOR, seven positions. VFO TUNE, SPINNER KNOB. FUNCTION Switch - OFF, STDBY, PTT-VOX, SPOT, MANUAL. FREQUENCY CONTROL-VFO, XTAL. DRIVE LEVEL. SPOT LEVEL. REL PWR ADJ. VOX DELAY. VOX SENSITIVITY. METER Switch-GRID, PLATE, ALC, REL PWR, HV. FINAL LOAD - 50 Ω fixed - INCrease. FINAL TUNE - 80-40-20-15-10. KEY jack. MICrophone input.

Rear Apron Controls And Connectors	FSK jack. High impedance input PHONE PATCH. Switched 117 V AC, 200 W receptacle. ACCESSORY SOCKET - 117 V AC ANT RELAY, GND. EXT BIAS, RCVR MUTE, RCVR 4-8 Ω, AUDIO TO SPKR, and RCVR 500 Ω. Chassis ground, GND, connector. RF OUTPUT coaxial connector. TO MONITOR (oscilloscope) output jack. MONITOR LEVEL control. 117 V 7 AMP AC line cord with inline plug fuses. SPOTTING SIGNAL output jack.
Indicating Devices	Single panel meter monitoring grid current, plate current, ALC voltage, relative power output, and high voltage.
Oscillators	All oscillators (except VFO) are crystal controlled. All crystals are furnished.
Power Source	117 volts, 50/60 cps AC.
Power Requirements	Power - Off - 4 watts; Standby-200 watts; CW key down - 400 watts.
Tube-Diode Complement	1 - 6EA8 Speech amplifier. 2 - OA95 Diode balanced modulator, matched. 1 - 12AT7 Sideband mixer. 1 - 6CB6 IF amplifier. 1/2 - 6AW8 Heterodyne mixer. 1 - 6CB6 VFO mixer. 1 - 6CL6 Driver. 2 - 6146 Final amplifier. 1/2 - 12AU7 Carrier oscillator. 1 - 12AT7 Sideband oscillator. 1/2 - 6AW8 Heterodyne oscillator. 1/2 - 12AU7 VOX amplifier. 1/2 - 6EA8 Relay amplifier. 1/2 - 6EA8 Anti-trip amplifier. 1/2 - 6EA8 Monitor tone audio oscillator. 1/2 - 6EA8 Monitor tone amplifier. 1 - 6AU6 VFO. 1 - 6CB6 Buffer-crystal oscillator. 1 - 6AL5 ALC rectifier. 1 - 5U4 Low voltage rectifier. 1 - 5R4 High voltage rectifier. 1 - OB2 Bias regulator. 1 - OA2 Low voltage regulator. 2 - OB2 Screen regulators. 2 - Silicon diodes, bias rectifiers. 2 - Silicon diodes, VOX rectifiers. 2 - Crystal diodes, FSK diodes. 1 - Crystal diode, relative power rectifier.
Cabinet Size	19-1/2" wide x 11-5/8" high x 16" deep.
Net Weight	85 lbs.
Shipping Weight	92 lbs.

INTRODUCTION

The HEATHKIT Model HX-10 "Marauder" Transmitter is a complete desk top transmitter with CW, AM, FSK, LSB, and USB modes of operation.

All modes, except AM, operate at a full 180 watts input on all bands. The AM mode consists of a transmitted carrier and lower sideband. Because of high plate dissipation, it is limited to an input of 75 watts.

The 80, 40, 20, 15, and 10 meter amateur bands are covered in seven 600 kc segments. The HX-10 Transmitter employs heterodyne conversion circuitry and a temperature-compensated VFO for maximum frequency stability. All modes are front panel switch selected. The FUNCTION Switch provides OFF, STANDBY, PUSH-TO-TALK and VOX, SPOT, and MANUAL positions for operating convenience.

A spinner type tuning knob and a 10" slide-rule scale are used for VFO tuning. A gear ratio of 165 to 1 is used for tuning ease and excellent reset ability. Backlash is held to a minimum by spring loading.

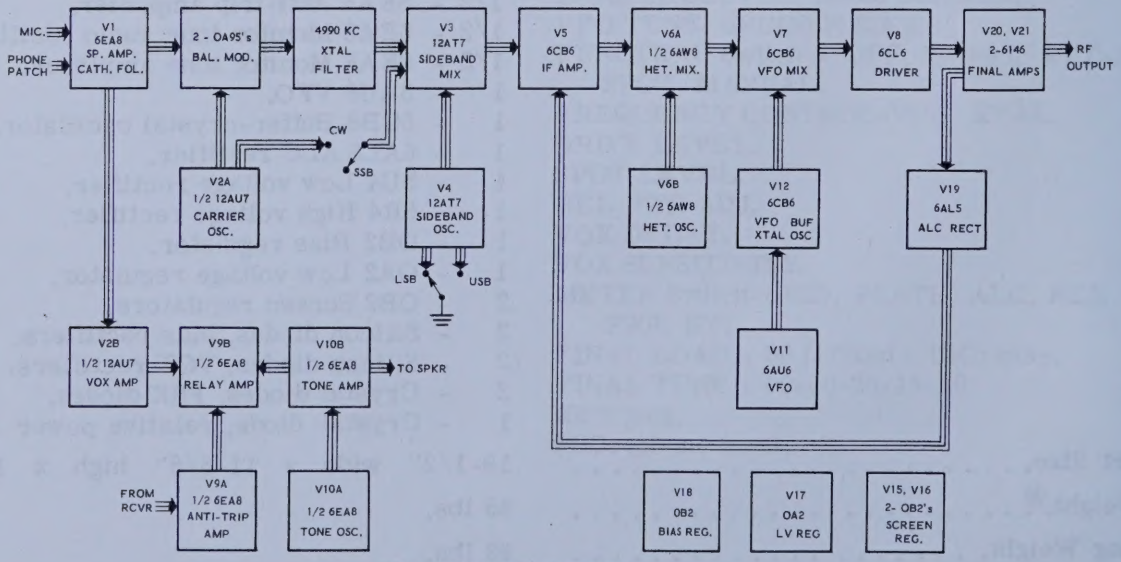
All VOX controls are front panel mounted so that VOX delay, sensitivity, and anti-trip operations are easily adjustable to suit operating conditions. For break-in CW operation, the VOX circuit is keyed with an audio tone, resulting in automatic changeover from receive to transmit conditions and providing a monitor tone in the receiver speaker at the touch of the radiotelegraph key. The VOX delay in CW operation is continuously variable from the front panel.

A combination of fixed 50 Ω and variable loading is employed, using a pi-network output circuit to suppress harmonic radiation and to provide quick tuneup and matching to low impedance amplifiers or transmission lines. Rear panel connections are provided for RF output to the antenna, monitoring oscilloscope with variable level control, receiver spotting signal with variable front panel control, phone patch input, FSK keying jack, and chassis ground connection. An accessory socket for antenna relay switching connections, receiver muting, speaker audio, external cutoff bias, and an additional ground connection is also provided.

Twenty-one tubes are used, including rectifiers and voltage regulators. Silicon diodes are used in the bias supply for long life and trouble-free operation.

The "Marauder" was designed with flexibility in mind. It may be used alone as a transmitter with excellent results or as an exciter to drive a high power linear amplifier with ease and compatibility.

The following Block Diagram and Circuit Description will provide a better understanding of this transmitter. Since this knowledge will be of help in the assembly and operation of the Transmitter, it is strongly recommended that the Circuit Description be read thoroughly before proceeding with assembly.



BLOCK DIAGRAM

CIRCUIT DESCRIPTION

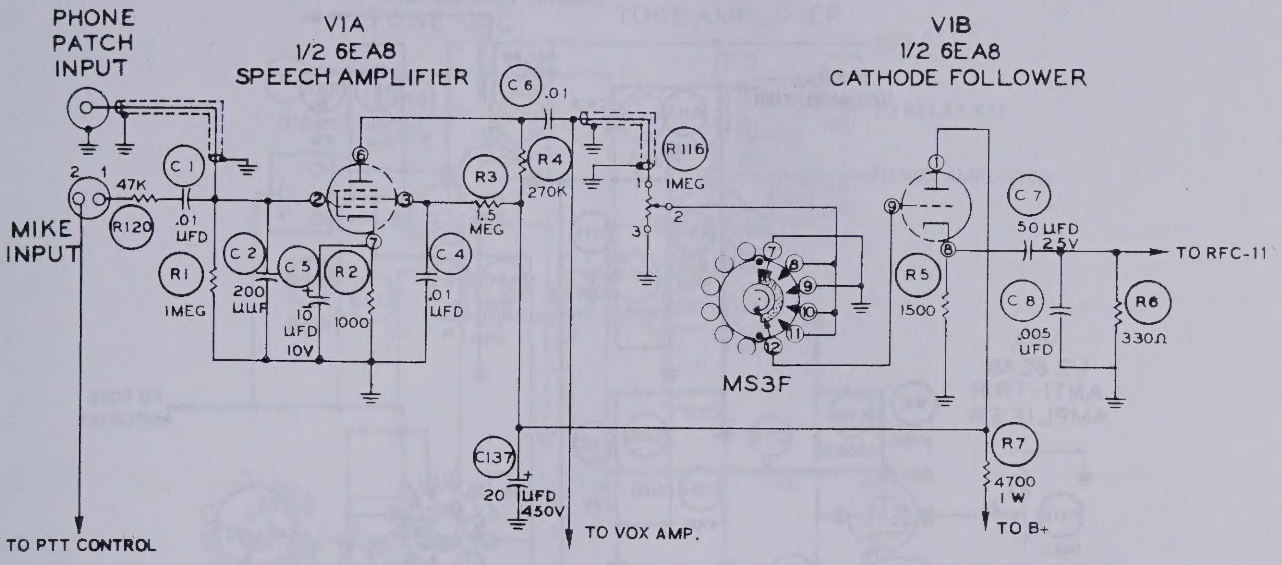


Figure 1

SPEECH AMPLIFIER CATHODE FOLLOWER (Figure 1)

The pentode section of a 6EA8 tube, V1A, is used as a speech amplifier. The frequency response of this stage is limited by capacitor C2 which also acts to shunt to ground any RF energy present. The amplified audio signal is coupled through capacitor C6 and Audio Gain Control R116 to the grid of the cathode follower triode section of tube V1B. A cathode follower circuit is employed to match the low impedance input of upper sideband crystal filter FL-1. (See Figure 6.) The speech amplifier and cathode follower circuits are made inoperative when the MODE switch segment MS3F is in the CW and FSK positions by grounding the audio signal at the cathode follower input. The VOX and MANUAL control circuits are also disconnected in these modes.

VOX AMPLIFIER (Figure 2)

The triode section of a 12AU7 tube, V2B, is used as the VOX amplifier. With the Mode Switch in the AM, LSB, or USB positions, the audio signal amplified at V1A is coupled through VOX Sensitivity Control R109 and resistor R60 to the VOX amplifier grid. Resistor R60 in the grid circuit prevents any distortion by grid rectification from being reflected to the speech amplifier - cathode follower circuits. When the Mode Switch is in the CW position, the VOX amplifier input is coupled from monitor tone oscillator-amplifier V10 in a similar manner. The resulting amplified VOX audio signal is then coupled through capacitor C110 to diode CR3.

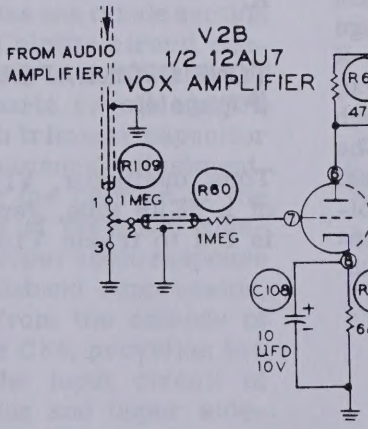


Figure 2

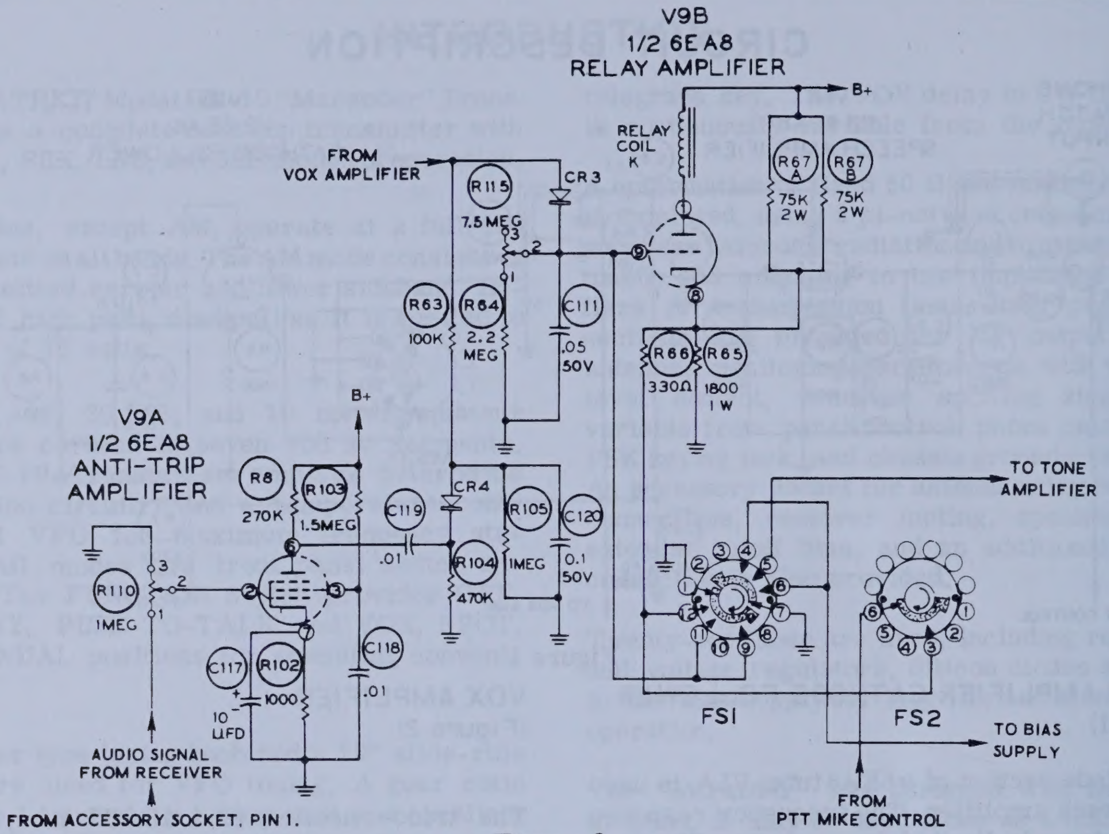


Figure 3

RELAY AND ANTI-TRIP AMPLIFIER (Figure 3)

The rectified voltage developed by the audio signal impressed across diode CR3 is directly coupled to the grid of the triode section of a 6EA8 tube, V9B. VOX delay is obtained by the time constant of the resistance-capacitance combination made up of C111, R64, and R115. The delay time is continuously variable by the VOX Delay Control R115 over a wide range. Under VOX control conditions V9B has its bias level set by a voltage divider network R65 and R67A/B. This preset value is of such a level that a small amount of positive voltage applied to the grid of V9B will cause relay K to close. In Push-To-Talk and Manual operation, the cathode of V9B is returned to ground through resistor R66 causing relay K to close. The grounding of R66 is automatic in the Manual position of the Function Switch and is controlled by the microphone button in the Push-to-Talk position.

The pentode section of a 6EA8 tube, V9A, is used as the anti-trip amplifier. An audio signal from the station receiver is coupled through the Accessory Socket to VOX Anti-Trip Control R110 and then to the grid of V9A. This signal is amplified by V9A, coupled by capacitor C119, and rectified by diode CR4. The negative voltage present at the RC network, R105 and C120, is coupled by isolating resistor R63 to the input side of CR3. This negative voltage will bias CR3 such that it will not conduct and close relay K.

TONE OSCILLATOR-TONE AMPLIFIER (Figure 4)

Tone oscillator, V10A, using the pentode half of a 6EA8 tube, generates an audio tone which is fed to triode V10B, which is used as a tone

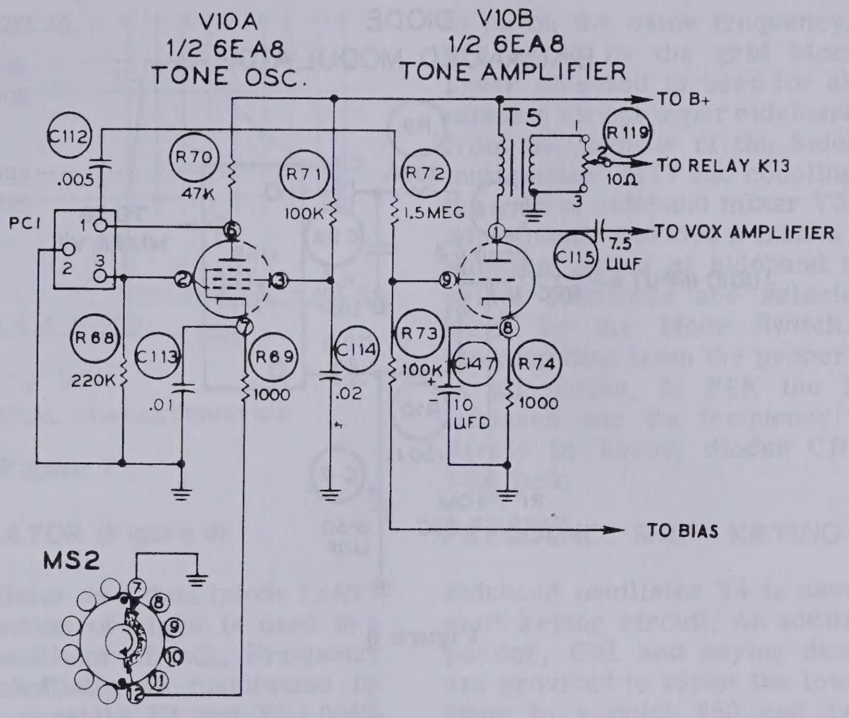


Figure 4

amplifier. The frequency of the audio tone is controlled by phase shift network PC1 in the oscillator circuit. This oscillator functions only in the CW mode of operation. The audio tone developed is used for two purposes; first, to key the VOX amplifier so that break-in CW operation is instantaneous with the closing of the key. Second, the output of the audio amplifier is coupled to the receiver speaker to provide a monitoring audio tone so that the operator may hear his keying during transmission. The audio amplifier is grid block keyed.

CARRIER OSCILLATOR (Figure 5)

The carrier oscillator utilizes one triode section of a 12AU7 tube, V2A, in a Colpitts circuit configuration. Frequency control is established by a 4.99 mc fundamental quartz crystal (.003% tolerance), Y1, across which trimmer capacitor C80 is placed for fine frequency adjustment. C80 is capable of placing the carrier at the optimum point on the slope of the upper sideband crystal filter FL1 for proper audio response and excellent unwanted sideband suppression. Output for SSB is taken from the cathode of this stage through capacitor C84, providing low impedance matching to the input circuit of the diode balanced modulator and upper sideband crystal filter FL1.

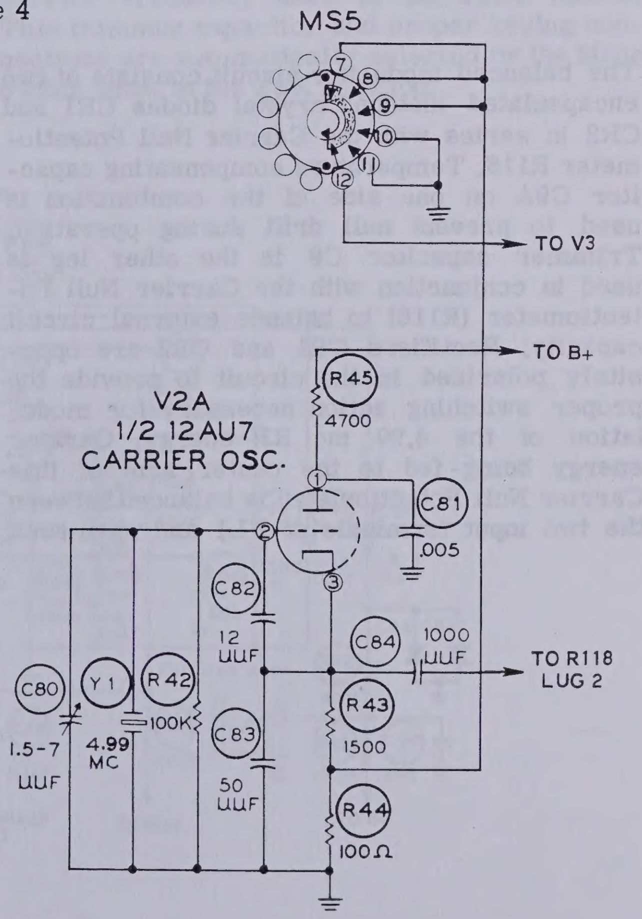


Figure 5

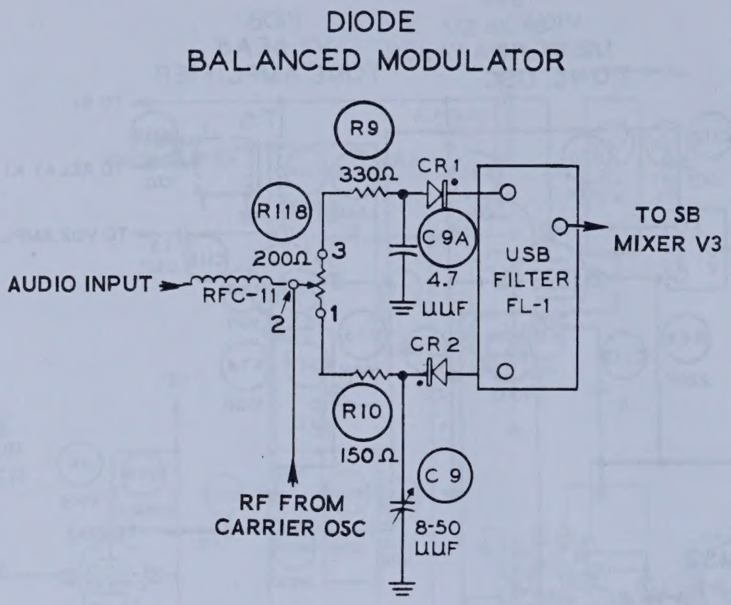


Figure 6

DIODE BALANCED MODULATOR (Figure 6)

The balanced modulator circuit consists of two encapsulated matched crystal diodes CR1 and CR2 in series with the Carrier Null Potentiometer R118. Temperature compensating capacitor C9A on one side of the combination is used to prevent null drift during operation. Trimmer capacitor C9 in the other leg is used in conjunction with the Carrier Null Potentiometer (R118) to balance external circuit capacity. Rectifiers CR1 and CR2 are oppositely polarized in the circuit to provide the proper switching action necessary for modulation of the 4.99 mc RF energy. Carrier energy being fed to the center arm of this Carrier Null Potentiometer is balanced between the two input terminals of FL1 and when such energy is equal, carrier suppression occurs. Upon the application of an audio signal from V1B the diodes are alternately biased and act as switches allowing modulated energy to be delivered to the input terminals of filter FL1.

UPPER SIDEBAND CRYSTAL FILTER (Figure 7)

The 4.99 mc upper sideband crystal filter is a lattice type filter designed to pass only the usable upper sideband frequencies contained in a modulated carrier at a frequency of 4.99 mc. The actual bandpass characteristics of the filter are shown in Figure 7. The resulting upper sideband energy is then fed at low impedance directly to the grid of sideband mixer V3. The carrier bypasses the crystal filter for CW, AM, and FSK modes of operation.

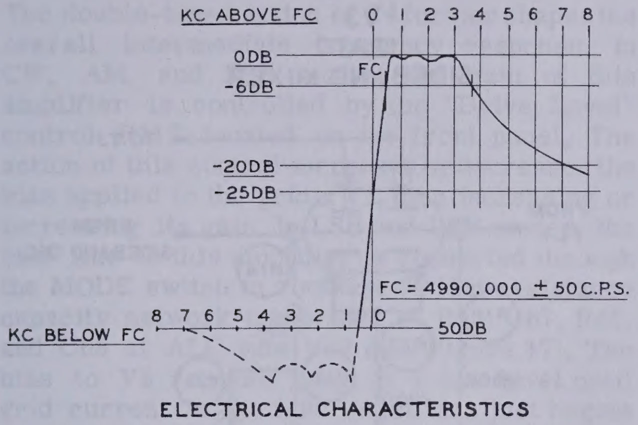


Figure 7

SIDEBAND OSCILLATOR (Figure 8)

The sideband oscillator is a dual triode 12AT7 tube, V4, each section of which is used in a Colpitts crystal oscillator circuit. Frequency control of each oscillator is maintained by fundamental quartz crystals Y2 and Y3 (.005% and .003% tolerance) using frequencies of 14.01 mc for upper and 13.99 mc for lower sideband generation. C91 provides adjustment of Y3 in order to allow both upper and lower sidebands to be on the same frequency. Both oscillators are keyed by the grid block method and the lower sideband is used for all modes of transmission except upper sideband. Output is coupled from the cathode of the Sideband Balance Potentiometer R117 and coupling capacitor C88 to the grid of sideband mixer V3. Sideband balance adjustment provides a means of obtaining equal sideband output at sideband mixer V3. Appropriate sidebands are selected from the front panel by the Mode Switch, which removes blocking bias from the proper oscillator desired in all modes. In FSK the LSB oscillator is unbiased and its frequency is shifted capacitively by keying diodes CR8 and CR9 at the FSK jack.

FREQUENCY SHIFT KEYING (Figure 8)

Sideband oscillator V4 is used as the frequency shift keying circuit. An additional trimmer capacitor, C92 and keying diodes CR8 and CR9 are provided to adjust the lower sideband oscillator to a point 850 cps removed from the carrier frequency used in all other modes. This trimmer capacitor and proper keying connections are automatically selected by the Mode Switch when in the FSK position.

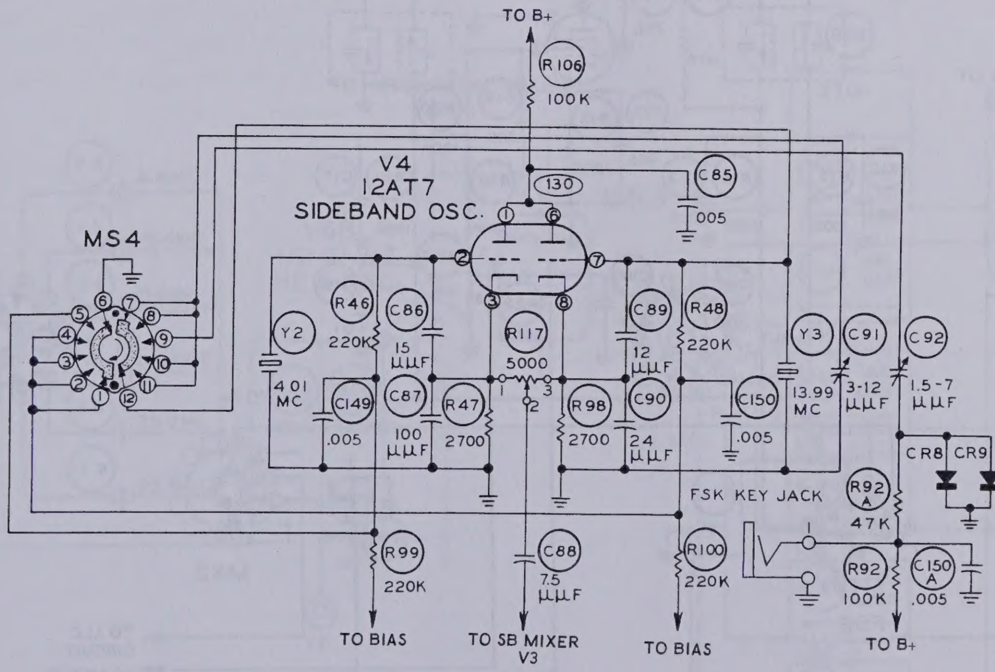


Figure 8

SIDEBAND MIXER (Figure 9)

The sideband mixer utilizes a dual triode 12AT7 tube, V3, in which the cathodes and plates are connected in parallel. The nominal 4.99 mc upper sideband energy from FL1 is impressed on grid 1 (pin 2), while either 4.01 mc or 13.99 mc energy from sideband oscillator, V4, is impressed on grid 2 (pin 7). The sum of the 4.99 mc and 4.01 mc signals produce the upper sideband 9.0 mc intermediate frequency signal. The difference between the 4.99 mc and 13.99 mc signals produces the lower sideband intermediate frequency of 9.0 mc. The resulting 9.0 mc signal is transformer coupled through IF transformer T3 (see Figure 10) to the grid of IF amplifier V5. Transformer T3 is double tuned to pass only energy near a 9.0 mc center frequency.

INTERMEDIATE FREQUENCY AMPLIFIER (Figure 10)

A 6CB6 pentode tube, V5, is used as a voltage amplifier to increase the signal produced by sideband mixer V3 to a usable level. Output from this stage is fed to double-tuned IF transformer T4, the secondary of which is capacity coupled by C19 (see Figure 12) to the grid of heterodyne mixer V6A.

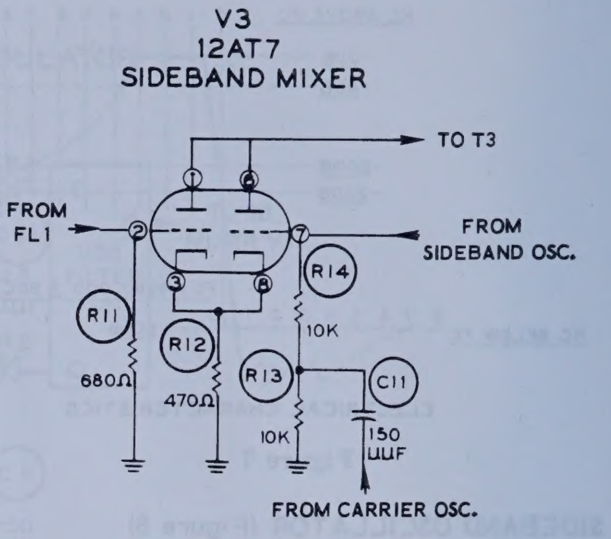


Figure 9

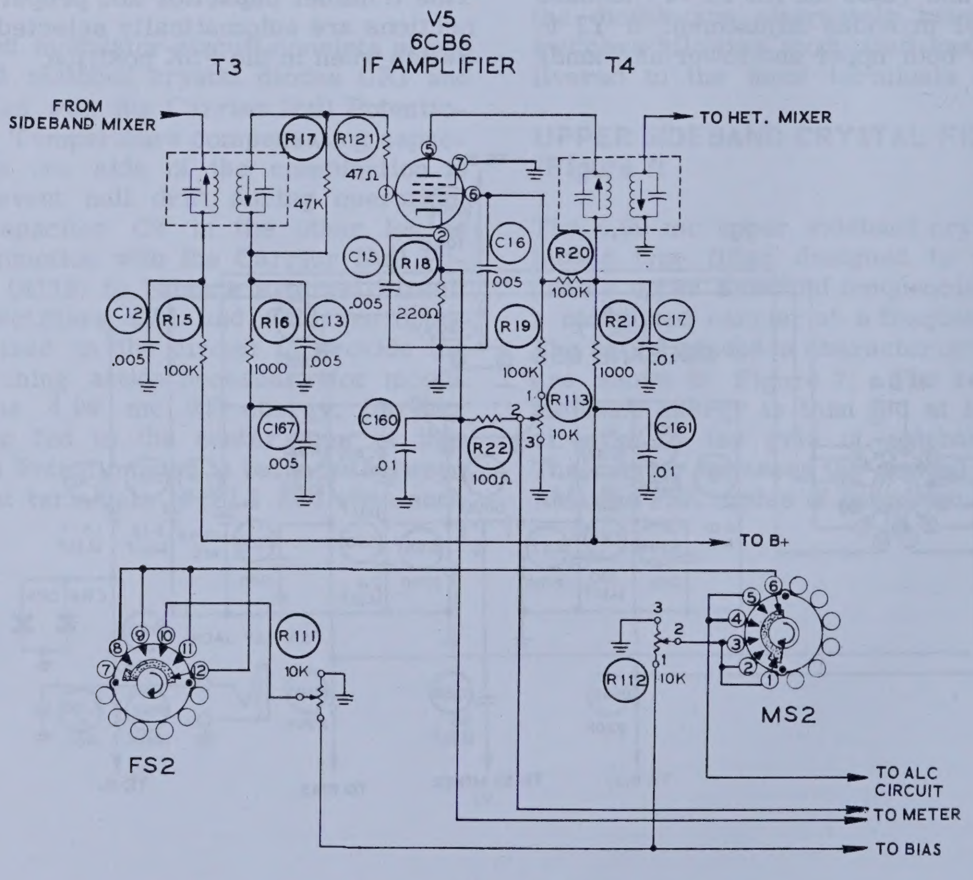


Figure 10

The double-tuned action of T4 further shapes the overall intermediate frequency response. In CW, AM, and FSK modes, the gain of this amplifier is controlled by the "Drive Level" control R112 located on the front panel. The action of this control increases or decreases the bias applied to the grid of V5, thus decreasing or increasing its gain. In LSB and USB modes, the bias line to this amplifier is connected through the MODE switch to a voltage divider resistance capacity network comprised of R40, C67, R41, and C68 at ALC tube V19 (see Figure 17). The bias to V5 remains fixed at a low level until grid current to the final amplifiers just begins to flow. When this occurs, the bias to V5 is increased, thus reducing the gain of the IF amplifier and maintaining Class AB1 operating conditions. A separate SPOT LEVEL control, R111, located on the front panel, is provided to reduce the gain of this amplifier under "spotting" conditions to a comfortable level for spotting either by the "zero-beat" or "talk-on-frequency" methods of operation. Control R111 is automatically placed in the circuit whenever the Function Switch is in the "Spot" position.

HETERODYNE OSCILLATOR (Figure 11)

The heterodyne oscillator uses the triode portion of a 6AW8 tube, V6B, in a tuned-plate crystal oscillator operating on the following frequencies:

BAND	HET. OSC. FREQUENCY
80 meters (3.5) -	not in operation.
40 meters (6.9) -	3.4 megacycles.
20 meters (13.9) -	10.4 megacycles.
15 meters (20.9) -	17.4 megacycles.
10-A meters (27.9) -	24.4 megacycles.
10-B meters (28.5) -	25.0 megacycles.
10-C meters (29.1)-	25.6 megacycles.

Frequency control is maintained by quartz crystals of .005% and .003% tolerance and grid voltages are set by measurement at test point TP. Tuning of the inductors set the required injection levels. The signal is coupled through capacitor C18 (see Figure 12) to heterodyne mixer V6A. Selection of the proper heterodyne oscillator crystal and coil for each band is made by the Band switch segments 1 and 3.

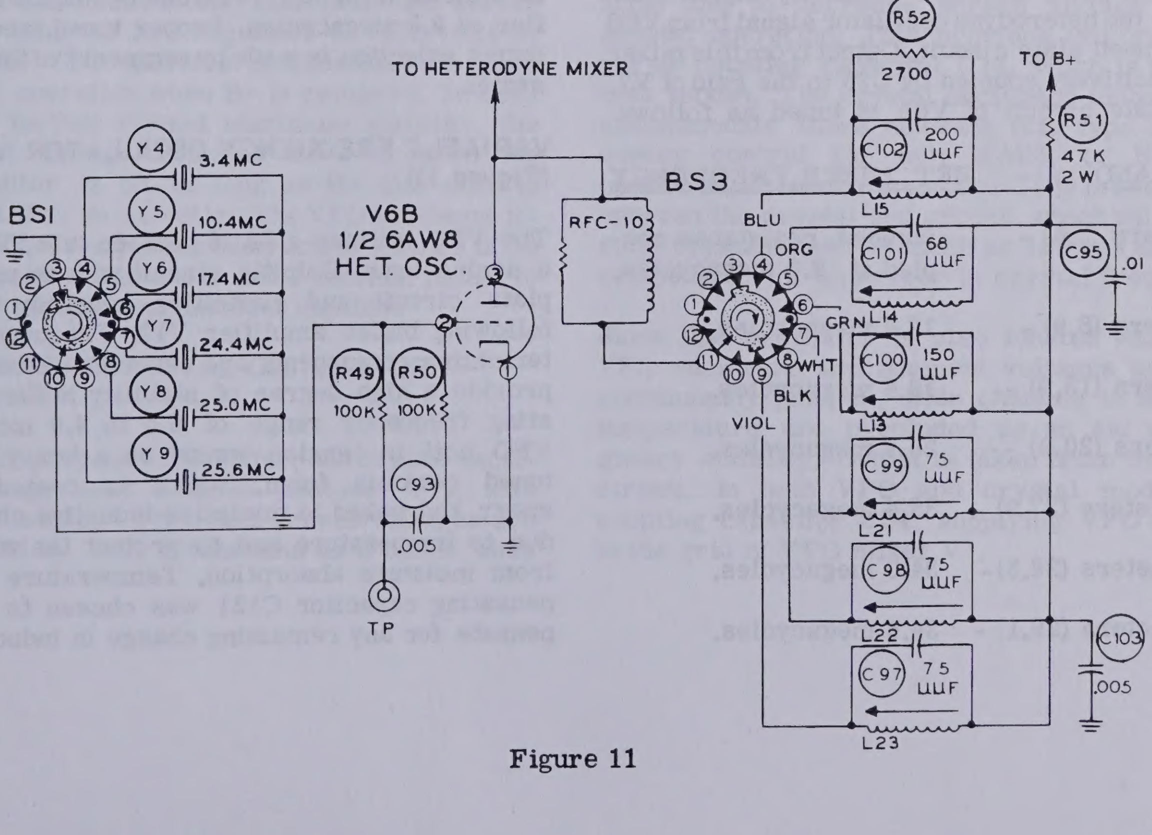


Figure 11

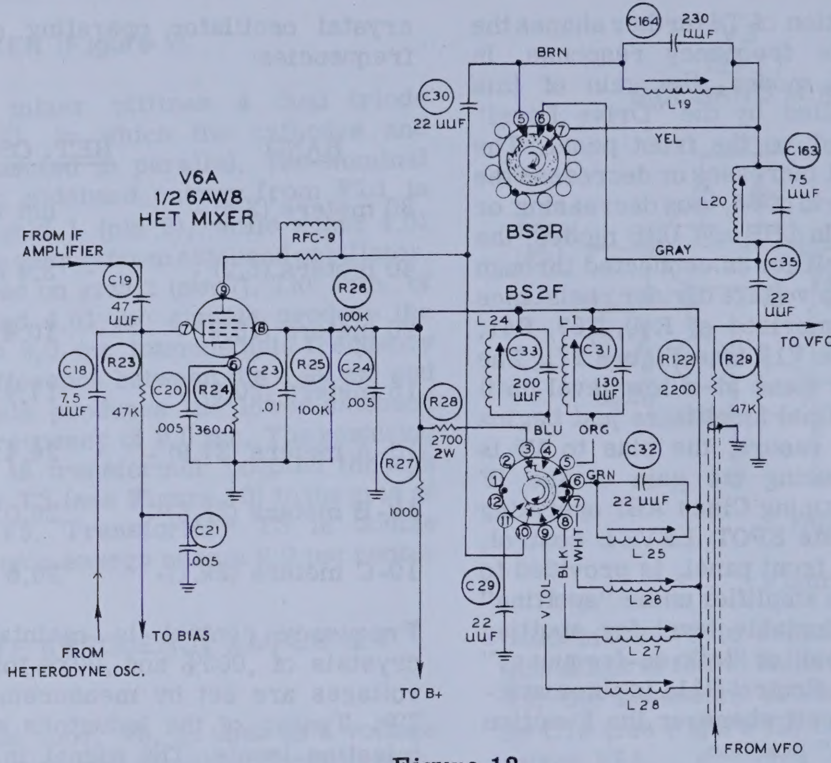


Figure 12

HETERODYNE MIXER (Figure 12)

The pentode section of a 6AW8 tube, V6A, is used as a mixer to combine the sum of the 9.0 megacycle intermediate frequency signal from V5 and the heterodyne oscillator signal from V6B in its tuned plate circuit. Output from this mixer is capacitively coupled by C35 to the grid of V7. The plate circuit of V6A is tuned as follows:

BAND	HET. MIXER FREQUENCY
80 meters (3.5) -	untuned, resistance coupled at 9.0 megacycles.
40 meters (6.9) -	12.4 megacycles.
20 meters (13.9) -	19.4 megacycles.
15 meters (20.9) -	26.4 megacycles.
10-A meters (27.9) -	33.4 megacycles.
10-B meters (28.5) -	34.0 megacycles.
10-C meters (29.1) -	34.6 megacycles.

The grid circuit of this mixer is grid block keyed for CW and grounded through R23 for all other modes of operation. When the 80 meter band is in operation, this mixer operates untuned as a straight through resistance-coupled amplifier at 9.0 megacycles. Proper tuned frequency output selection is made by segment 2 of the Band switch.

VARIABLE FREQUENCY OSCILLATOR (Figure 13)

The VFO utilizes a 6AU6 pentode tube, V11, in a series-tuned Colpitts circuit with an untuned plate circuit and capacitive coupling to the following buffer amplifier V12. Frequency determining components are carefully selected to provide a high degree of stability in the operating frequency range of 5.5 to 4.9 mc. The VFO coil is tension wound on a heavy slug-tuned ceramic form, which is coated with epoxy and baked to minimize inductive changes due to temperature and to protect the winding from moisture absorption. Temperature compensating capacitor C121 was chosen to compensate for any remaining change in inductance

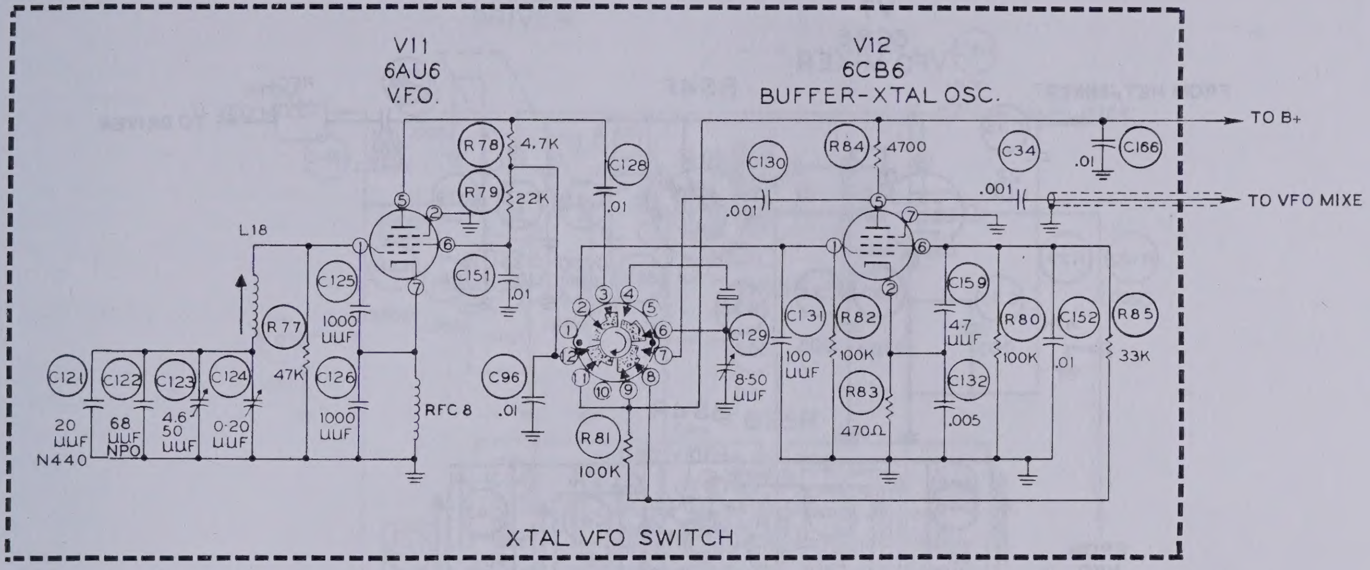


Figure 13

due to heat. Padder capacitor C124 is a stable miniature ceramic air trimmer capacitor providing proper bandspread. The main tuning capacitor, C123, is a heavy duty, double-bearing, air variable ceramic capacitor of solid four-support bar construction. Both plate and screen voltage sources are regulated at +150 volts by V17. The VFO operates continuously except in crystal operation when B+ is removed. To contribute further toward maximum stability, the filament voltage remains on even when the transmitter is off as long as the line cord is connected to an AC outlet. The VFO enclosure itself is of three piece construction formed of 19 gauge cold rolled steel and cadmium plated to provide adequate mechanical rigidity.

VFO BUFFER CRYSTAL OSCILLATOR (Figure 13)

The dual-purpose VFO-buffer, and crystal oscillator stage uses a 6CB6 pentode, V12, with untuned output. Plate and screen voltages are regulated by V17. It functions as a buffer when VFO operation is selected and as a quartz, crystal-controlled oscillator when crystal operation is selected. A voltage divider network comprised of R80, R81, and R85 is designed to increase screen voltage during the buffer operation and to decrease screen voltage during crystal operation. This provides uniform output at coupling capacitor C34, which is used in both modes. The crystal oscillator feature will accommodate those desiring this type of frequency control for net, MARS, or NOVICE operation. Trimmer capacitor C129 is connected between the crystal and ground, which will swing most crystals used as much as 100 cps and thus compensate for any error in crystal frequency.

Since this oscillator is also located within the VFO enclosure and filament voltages are also continuously present, wide changes in ambient temperature are precluded as an aid to frequency stability. Output is taken from the plate circuit, in both VFO and crystal modes, by coupling capacitor C34, supplying VFO energy to the grid of VFO mixer V7.

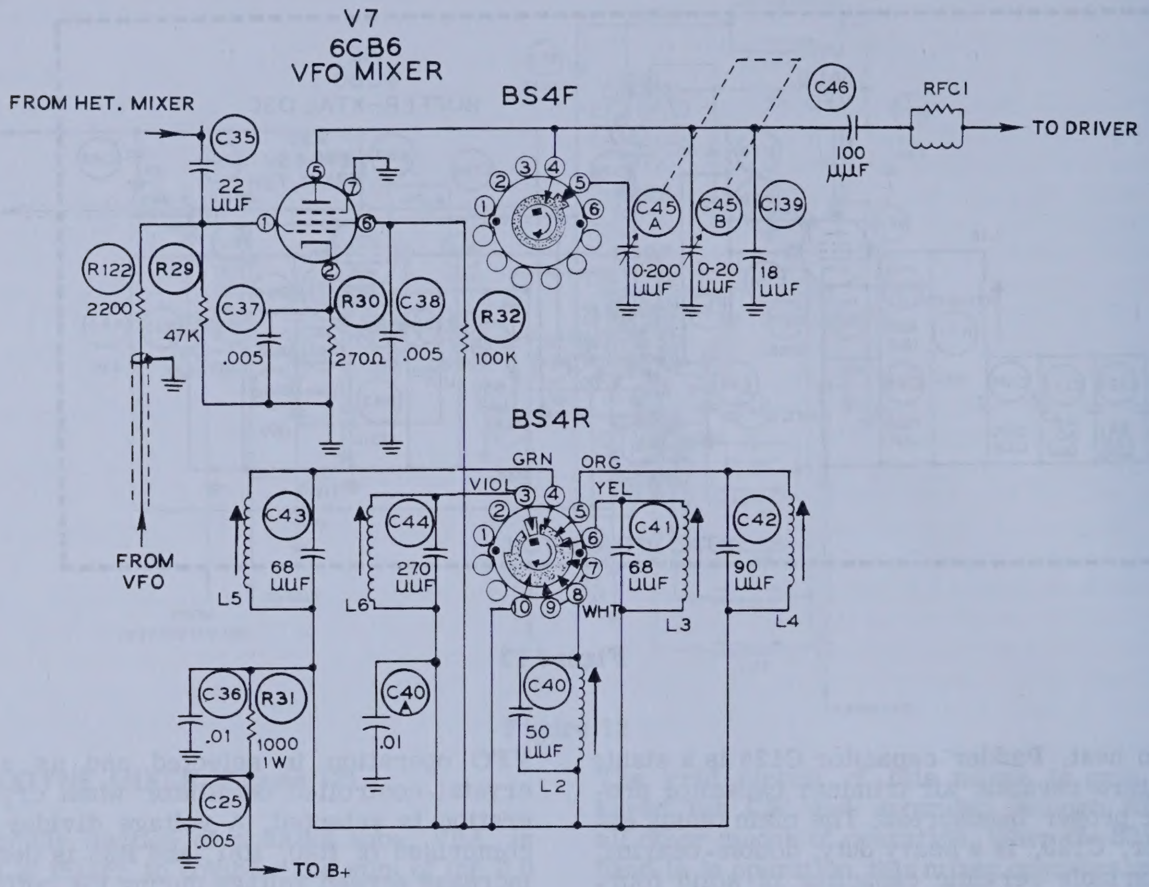


Figure 14

VFO MIXER (Figure 14)

A 6CB6 pentode, V7, performs the third mixing function, combining the heterodyne mixer and VFO signals received at its grid and selecting the difference between the two in its plate circuit, which is now at the operating signal frequency. Tuning of the VFO mixer is done by the VFO mixer section of Driver Tuning Capacitor C45A/B.

The VFO mixer section of Driver Tuning Capacitor C45A/B is a two-section variable capacitor, ganged to the driver section for tuning the plate circuit of V7. The output is capacitively coupled to V8 by capacitor C46 through parasitic choke RFC1. Band switch segment 4 is used to ground all unused coils for RF as well as to select the proper VFO mixer tuning capacity.

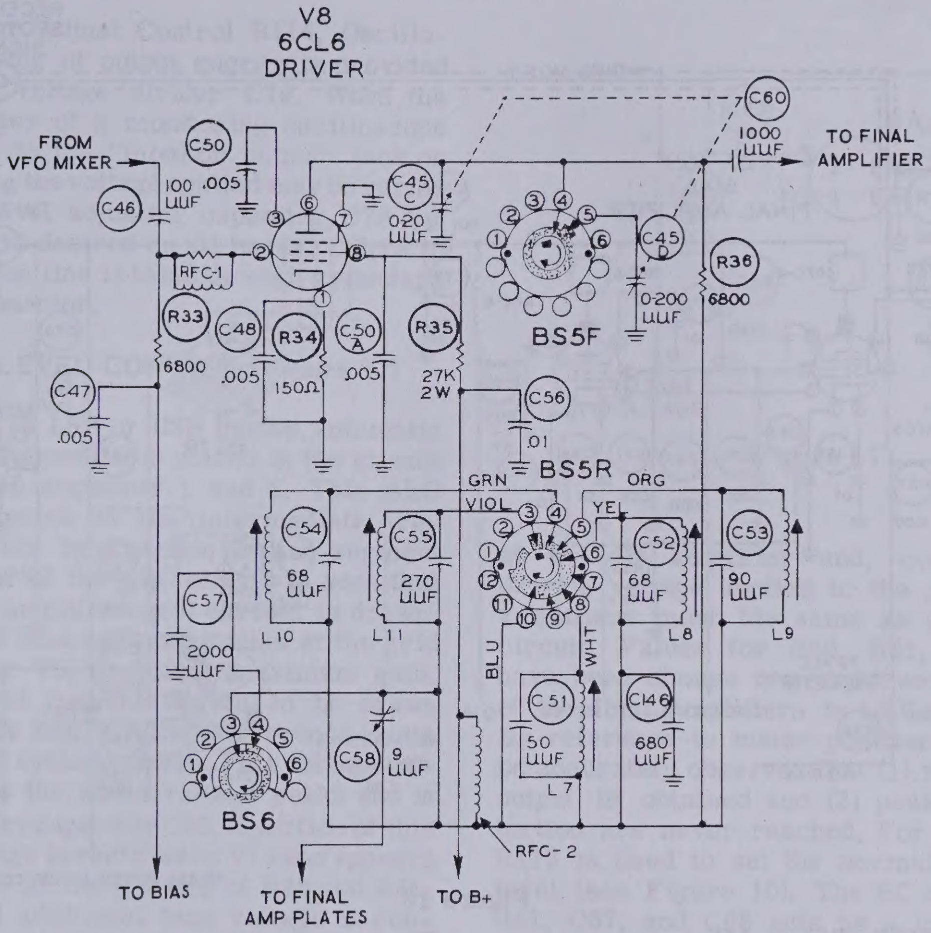


Figure 15

DRIVER (Figure 15)

The driver stage uses a 6CL6 pentode tube, V8, as a voltage amplifier. V8 increases the relatively low signal level of the VFO mixer to a value sufficient to drive final amplifier tubes V20 and V21. Since its plate and grid circuits are tuned to the operating frequency, shielding at the tube socket base is provided to prevent self-oscillation. Driver tuning capacitor sections C45C/D are used to tune the plate circuit to resonance. Unused coils are shorted for RF by segment 5 of the Band switch. The grid circuit of the driver stage is biased to cut-off. Bias is removed through R33 when keyed for CW or FSK and keyed through relay K for AM, LSB, and USB modes of operation. Parasitic choke RFC1 is used in series with the grid of this stage to minimize spurious response. Neutralizing energy is coupled from the final amplifiers through capacitor C58 to the plate inductors of this stage. Band switch segment 6 switches in capacitor C57 for 80 meters, while capacitor C146 remains in the circuit for all other bands.

The output is capacitively coupled through C60 to final amplifier tubes V20 and V21.

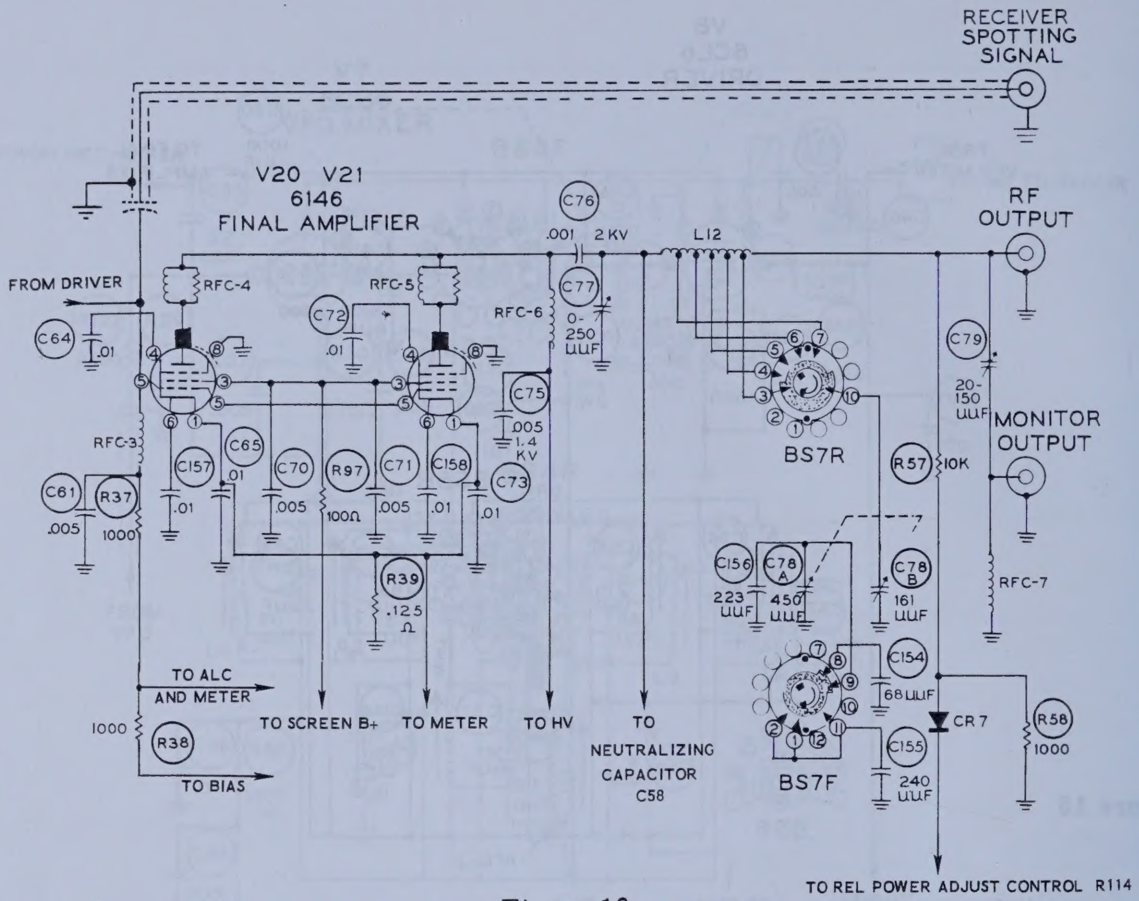


Figure 16

FINAL AMPLIFIER (Figure 16)

Two parallel connected 6146 beam power pentodes, V20 and V21, are used as class AB1 linear final amplifiers. A fixed operating bias of -50 volts is maintained on the control grids of these amplifiers, limiting zero signal plate current to 50 milliamperes. Under "key-up" conditions in CW, AM, and FSK modes, bias regulator V18 is ungrounded and -140 volts provides complete cutoff. RF driving voltage is developed across RFC3. Peak driving voltage is continuously variable in CW, AM, and FSK modes and is set by Drive Level Control R112 from the front panel. In LSB and USB modes, the peak driving voltage is controlled by Audio Gain Control R116 and the limiting action of the Automatic Level Control stage V19. The screen voltage to the final amplifiers is regulated by V15 and V16 at +216 volts. Plate voltage is shunt-fed through RFC6 and bypassed for RF by C75.

The output of the amplifiers is coupled through capacitor C76 to the pi section output tank. RF chokes RFC4 and RFC5 in the amplifier plate lead eliminate any tendency toward parasitic oscillation. The proper tap on plate tank coil L12 is selected by segment 7 of the Band switch. Plate tuning resonant points for each band are shown on the front panel. Loading capacitor C78 consists of a two-section, variable capacitor, providing a limited-range variable loading control. The front section of segment 7 of the Band switch switches in fixed loading capacitors in parallel with variable capacitor C78, providing fixed 50 Ω impedance points for each band. An output sampling circuit, consisting of R57, R58, CR7, R114, and C107 (see Figure 19), allows a variable amount of RF energy, converted to DC, to appear at the meter terminals when the Meter Switch is in Relative Power position. This allows "tuneup" by watching this single indication. Meter sensitivity, when in the Relative Power position, is adjustable from the front panel by

Relative Power Adjust Control R114. Oscilloscope monitoring of output energy is provided by capacitive voltage divider C79. When the deflection plates of a monitoring oscilloscope are connected to the "monitor output" jack on the rear apron, the voltage applied may be varied by Monitor Level adjusting capacitor C79 for any trace height desired on all bands. Output to the transmission line is taken through a standard RF coaxial connector.

AUTOMATIC LEVEL CONTROL (Figure 17)

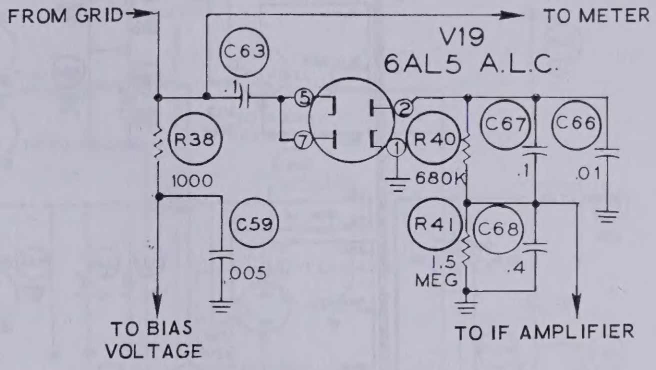


Figure 17

When operated in LSB or USB modes, automatic level control stage V19 is placed in the circuit by Mode Switch segments 1 and 2. This ALC stage is connected to the intermediate frequency amplifier by Function Switch segment 2. The function of the ALC circuit is such that when no final amplifier grid current is drawn, a normal fixed bias condition exists at the grid of IF amplifier V5, providing maximum gain. When final grid current begins to be drawn through resistor R38, a voltage difference exists at the plate and cathode of V19. This voltage difference follows the audio voltage peaks and is coupled to V19 by capacitor C63. A portion of this fluctuating voltage is rectified by V19 and appears as bias voltage at the junction of R40 and R41. This developed additional bias voltage is connected through the Mode Switch and resistors R16 and R17 (see Figure 10), to the grid of the IF amplifier. This decreases the gain of the IF amplifier and, consequently, the driving voltage applied to the grid of the final amplifiers much the same as a standard AGC circuit. Values for R40, R41, C67, and C68 have been chosen to prevent serious overdrive of the final amplifiers in LSB and USB modes. By reference to meter position "ALC," it may be accurately observed that (1) maximum power output is obtained and (2) peaks causing distortion are never reached. For ALC metering, R113 is used to set the normal meter resting level (see Figure 10). The RC network of R40, R41, C67, and C68 acts as a load circuit with delay time quick-acting enough to effectively prevent overdrive in all but extreme Audio Control settings of R116.

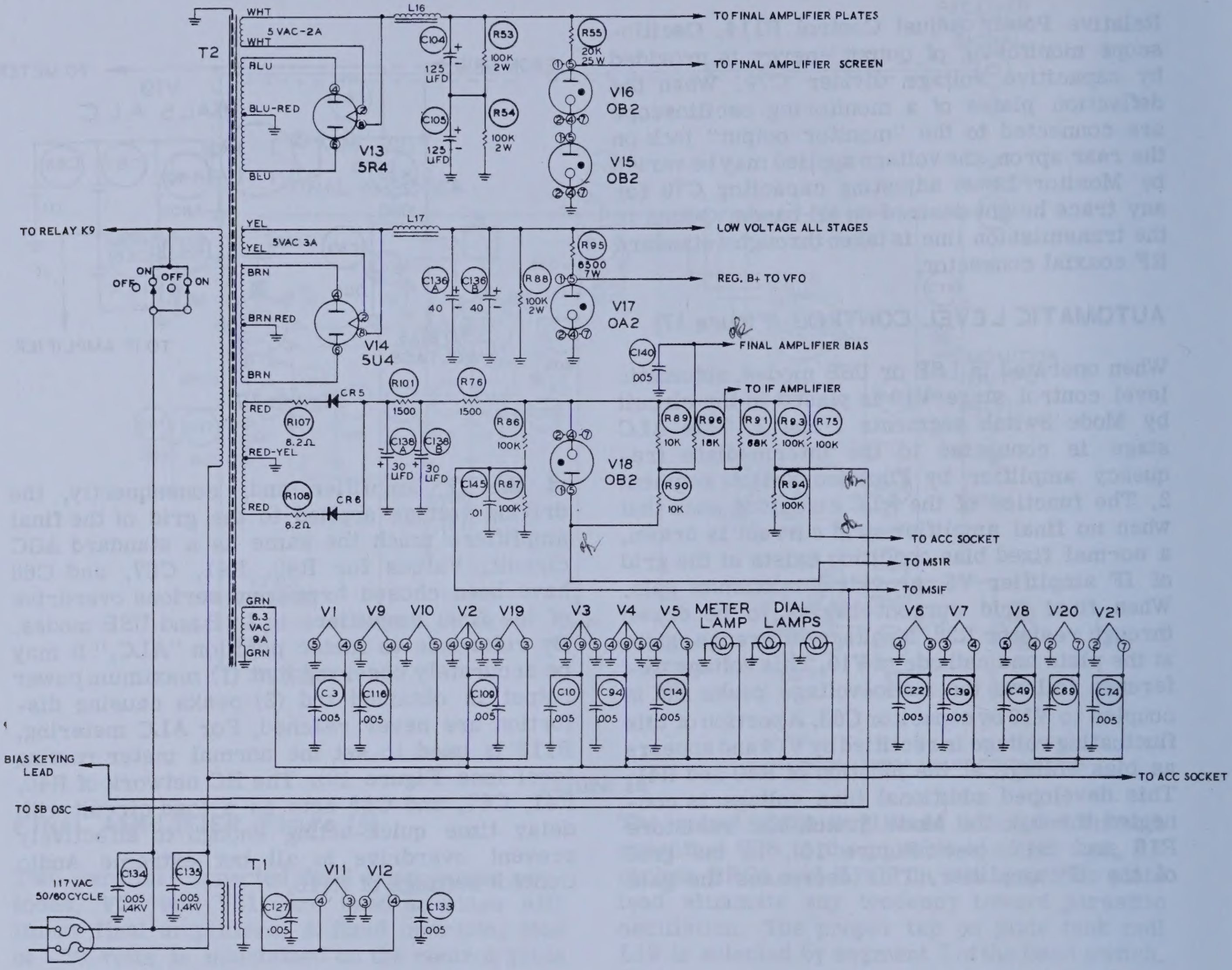


Figure 18

POWER SUPPLY (Figure 18)

Total power requirements are delivered by T1 and T2. T1 is a 6.3 volt AC filament transformer permanently connected to the VFO filaments. As long as the line cord remains connected to the 117 volt AC main the VFO filaments are kept in a preheated condition. The primary side is fused by the line cord plug fuses. The main power transformer, T2, contains seven color-coded windings in a sealed transformer case. The seven windings are: the primary 117 volt AC 50/60 cps winding, separate filament winding for high voltage 5R4 rectifier V13 at 5.0 volts AC 2 amperes, separate filament winding for low voltage 5U4 rectifier V14 at 5.0 volts AC 3 amperes, high voltage winding for 5R4 rectifier V13 rated at 1880 volts AC center-tapped, low voltage winding for 5U4 rectifier V14 rated at 814 volts AC center tapped, main filament winding rated at 6.3 volts AC at 9 amperes, and a 222 volt AC center tapped bias winding rated at 25 milliamperes DC. Control of the primary is made through two parallel connected SPST snap-action switches located on the rear of the Function Switch.

The bias system uses two 500 PIV, 500 milliampere silicon rectifiers, CR5 and CR6, in a full-wave rectifier circuit. Surge resistors R107 and R108 are used on the input side, while the combination of R101 and C138A/B on the output side provide ripple-free bias. Bias regulator V18 is ungrounded under key-up conditions for CW, AM, and FSK operation, allowing the full bias voltage to appear at the grids of final amplifiers V20 and V21. In LSB, USB key-up, CW, AM, and FSK key-down conditions, the positive end of V18 is returned to ground and a normal operating bias of -52 volts appears at the final amplifier grids. The balance of the bias system consists of resistive voltage divider networks to provide proper operational bias and decoupling to the remainder of the transmitter.

The low voltage 5U4 rectifier stage, V14, uses a conventional full-wave rectifier circuit with L17 for choke input filtering. Capacitors C136A/B provide the balance of filtering. A discharge path through R88 when the supply is turned off removes any residual B+. Regulated voltage at V17 supplies +150 volts for the VFO and crystal oscillator only. The high voltage 5R4 rectifier, V13, also operates in a conventional full-wave rectifier circuit with swinging choke L16 providing adequate smoothing under varying load conditions. Series connected capacitors, C104 and C105, with voltage equalizing resistors, R53 and R54, provide adequate filtering and excellent dynamic regulation. R53 and R54 act to discharge the supply when turned off. R55 with V15 and V16 act to provide a constant bleeder current when in operation. V15 and V16 regulate the screen voltage under all load conditions at +216 volts. The total power supply represented by transformer T2 and its associated circuitry becomes operational when the Function Switch is turned from OFF to STANDBY.

METERING CIRCUIT (Figure 19)

Metering is provided by a front panel mounted, 0 to 1 milliammeter with 50 Ω resistance. The meter is connected directly to the five-position Meter Switch and bypassed at its terminals for RF by capacitor C106. In the ALC position, the meter is connected across resistor R22 (see Figure 17). One end of R22 is connected to the cathode of IF amplifier V5, which has a small fixed positive potential. Control R113 is in the ground end of a screen resistive divider network made up of R20, R19, and R113. R113 is used to set the meter pointer to a predetermined point on the meter scale, depending on the potential existing between points A and B on R22. Thus, in the LSB and USB modes of operation, any change in the cathode current of V5 changes the potential difference across the meter, causing a deflection with modulation. In all other Meter Switch positions except LSB and USB, one end of the meter connection is broken by the Mode Switch and the ALC function is not operative. In the Grid current, Plate current, High Voltage, and Relative Power Meter Switch positions, the meter acts as a voltmeter. In the Plate position, the meter reads on the 0 to 400 milliampere scale as a result of the voltage developed across resistor R39, indicating the total cathode current of V20 and V21. In the High Voltage position, the meter reads on the 0 to 1000 volt scale the potential difference between dropping resistor R56 and ground. In the Relative Power position, the meter reads the potential difference between the center arm of Relative Power Control R114 and ground. This is, as stated, a "relative" reading and may be adjusted by control R114 located on the front panel. In the Grid position, the meter reads on the 0 to 1.000 scale the voltage developed across resistor R38.

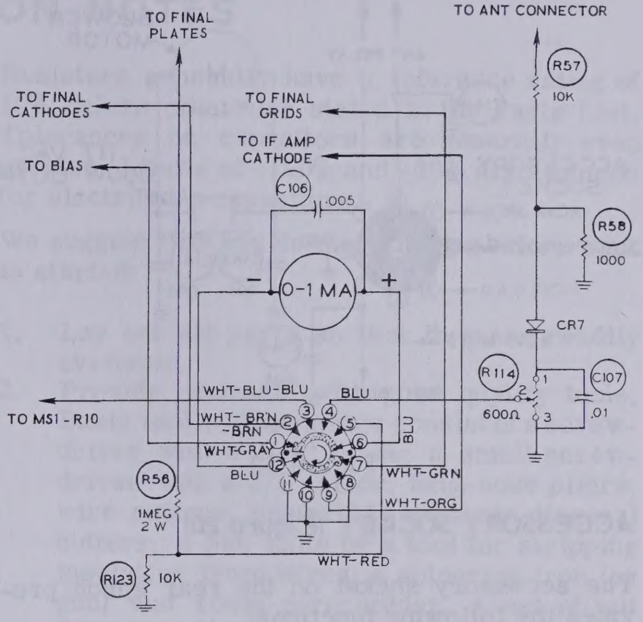


Figure 19

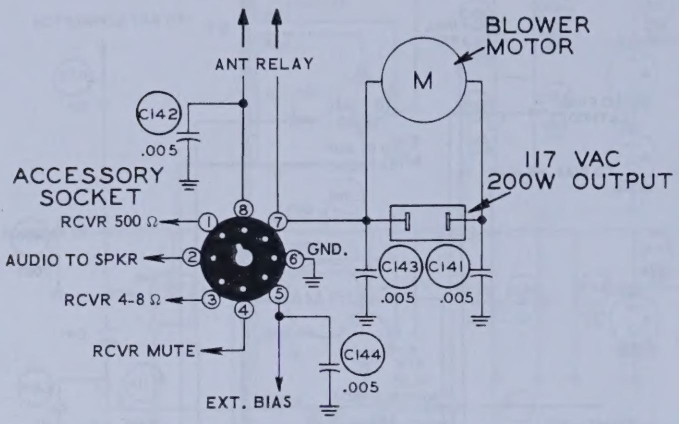


Figure 20

ACCESSORY SOCKET (Figure 20)

The accessory socket on the rear apron provides the following functions:

Pin 1 - This pin carries receiver 500 Ω audio voltage to anti-trip amplifier V9A. In receive position, 500 Ω audio voltage is connected through accessory socket terminal 1 to Anti-Trip Control R110 and to the grid of anti-trip amplifier V9A.

Pin 2 - This pin carries receiver audio voltage from the transmitter to the speaker through relay K. In the receive position, normal receiver audio is present at the speaker. In the CW mode, transmit position, the audio signal from amplifier V10B is present at the speaker as a keying monitor tone. For all other modes, no voltage is present.

Pin 3 - Audio from receiver. This pin is connected to the receiver 4-8 Ω audio output line and connects the audio voltage to the receiver speaker at pin 2 through relay K. When in the transmit position, the receiver audio is disconnected from the receiver speaker and the speaker is connected to relay K terminal 13 where it receives an audio signal from monitor tone amplifier V10B in the CW mode. This serves as a CW keying monitor. Resistor R59 is provided at relay K terminal 11 to provide a low impedance load to the receiver audio output in the transmit position. In modes other than CW, the station speaker will be muted due to the absence of any audio signal.

Pin 4 - Receiver mute. This pin functions to remove the receiver cutoff bias in normal receive position. In transmit position, it ungrounds the line restoring cutoff bias and muting the receiver when relay K closes. When relay K again opens and is in the receive position, the receiver bias line is again grounded and normal receiver operation is resumed.

Pin 5 - External bias. The full -140 volts of keyed DC bias is available at this pin. The external bias line is keyed to return to zero potential in CW, AM, FSK, LSB, and USB modes. CAUTION: It should be noted that no current is intended to be delivered from this source. It is to be used as cut-off bias only.

Pin 6 - Ground. This ground is provided in addition to ground terminal CG on the rear apron.

Pin 7 is the common AC connection. Pin 8 is interrupted at relay K terminals 9 and 10 for normal antenna relay operation.

Pins 7 and 8 - 117 volt AC antenna relay connection.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be a stable instrument, operating at a high degree of dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.

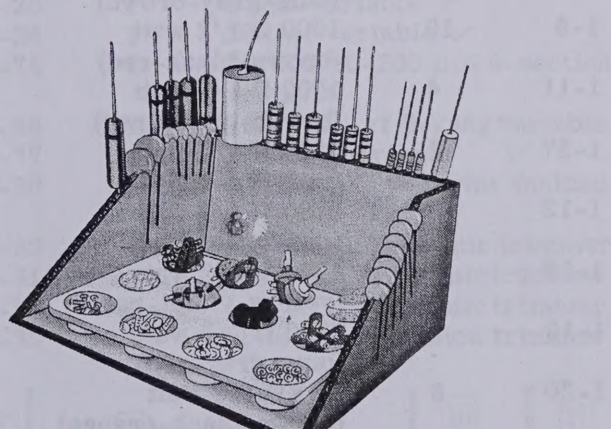
UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the charts and other information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacement section and supply the information called for therein. Include all inspection slips in your letter to us.

Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.
2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a pen knife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.

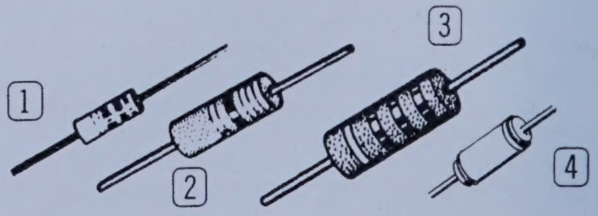
Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.



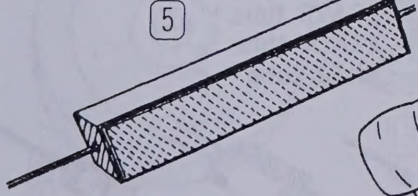
PARTS LIST

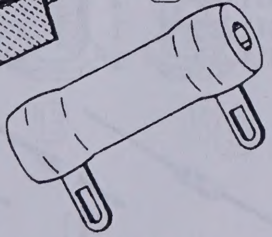
The circled numbers in the Parts List are keyed to the circled numbers on the parts drawings to aid in parts identification.

PART No.	PARTS Per Kit	DESCRIPTION
Resistors		
① 1-130	2	8.2 Ω 1/2 watt (gray-red-gold) 1-820
1-1	1	47 Ω 1/2 watt (yellow-violet-black)
1-3	3	100 Ω 1/2 watt (brown-black-brown)
1-66	2	150 Ω 1/2 watt (brown-green-brown)
1-45	1	220 Ω 1/2 watt (red-red-brown)
1-42	1	270 Ω 1/2 watt (red-violet-brown)
1-4	3	330 Ω 1/2 watt (orange-orange-brown)
1-5	1	360 Ω 1/2 watt (orange-blue-brown)
1-6	2	470 Ω 1/2 watt (yellow-violet-brown)
1-7	2	680 Ω 1/2 watt (blue-gray-brown)
1-9	10	1000 Ω 1/2 watt (brown-black-red)
1-11	4	1500 Ω 1/2 watt (brown-green-red)
1-57	1	2200 Ω 1/2 watt (red-red-red)
1-13	3	2700 Ω 1/2 watt (red-violet-red)
1-16	3	4700 Ω 1/2 watt (yellow-violet-red)
1-19	2	6800 Ω 1/2 watt (blue-gray-red)
1-20	6	10 KΩ 1/2 watt (brown-black-orange)
1-69	1	18 KΩ 1/2 watt (brown-gray-orange)
1-22	1	22 KΩ 1/2 watt (red-red-orange)
1-24	1	33 KΩ 1/2 watt (orange-orange-orange)
1-25	8	47 KΩ 1/2 watt (yellow-violet-orange)
1-60	1	68 KΩ 1/2 watt (blue-gray-orange)
1-26	21	100 KΩ 1/2 watt (brown-black-yellow)
Resistors (cont'd.)		
1-29	5	220 KΩ 1/2 watt (red-red-yellow)
1-30	2	270 KΩ 1/2 watt (red-violet-yellow)
1-33	1	470 KΩ 1/2 watt (yellow-violet-yellow)
1-34	1	680 KΩ 1/2 watt (blue-gray-yellow)
1-35	3	1 megohm 1/2 watt (brown-black-green)
1-37	1	2.2 megohm 1/2 watt (red-red-green)
1-36	4	1.5 megohm 1/2 watt (brown-green-green)
② 1A-13	1	22 Ω 1 watt (red-red-black)
1A-53	1	1800 Ω 1 watt (brown-gray-red)
1A-2	1	1000 Ω 1 watt (brown-black-red)
1A-24	1	4700 Ω 1 watt (yellow-violet-red)
③ 1B-1	1	2700 Ω 2 watt (red-violet-red)
1B-6	1	27 KΩ 2 watt (red-violet-orange)
1B-10	1	47 KΩ 2 watt (yellow-violet-orange)
1B-29	2	75 KΩ 2 watt (violet-green-orange)
1B-24	4	100 KΩ 2 watt (brown-black-yellow)
1B-31	1	1 megohm 2 watt 5% (brown-black-green)
④ 2-137	1	.125 Ω 1/2 watt 1% precision resistor
✓ ⑤ 3G-13	1	6500 Ω 7 watt wire-wound
✓ ⑥ 3Y-1	1	20 KΩ 25 watt wire-wound

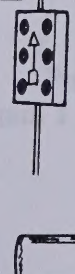


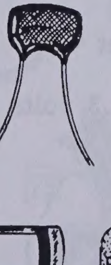
PART No.	PARTS Per Kit	DESCRIPTION
Capacitors		
⑦ 20-98	2	12 μμf 500 V mica molded (brown-red-black) ✓
⑧ 20-99	4	22 μμf 500 V resin dipped ✓
20-77	1	24 μμf 500 V resin dipped ✓
20-97	3	50 μμf 500 V resin dipped ✓
20-31	1	68 μμf 2000 V mica molded ✓
20-76	5	68 μμf 500 V resin dipped ✓
20-91	1	223 μμf 500 V mica molded ✓
20-49	1	240 μμf 500 V mica molded (red-yellow-brown) ✓
20-7	1	2000 μμf 500 V mica molded (red-black-red) ✓
20-48	1	.001 μfd 2 kv mica molded ✓
20-94	1	1000 μμf 500 V mica molded (brown-black-red) ✓
20-52	3	7.5 μμf 500 V mica resin dipped ✓
20-118	1	15 μμf 500 V mica resin dipped ✓
20-101	1	47 μμf 500 V mica resin dipped ✓
20-110	4	75 μμf 500 V mica resin dipped ✓
20-119	2	90 μμf 500 V mica resin dipped ✓
20-102	3	100 μμf 500 V mica resin dipped ✓
20-104	1	130 μμf 500 V mica resin dipped ✓
20-103	2	150 μμf 500 V mica resin dipped ✓
20-108	3	200 μμf 500 V mica resin dipped ✓
20-111	1	230 μμf 500 V mica resin dipped ✓
20-114	2	270 μμf 500 V mica resin dipped ✓
20-107	1	680 μμf 300 V mica resin dipped ✓
20-122	3	1000 μμf 300 V mica resin dipped ✓

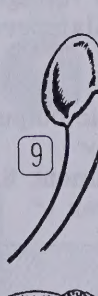


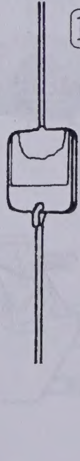


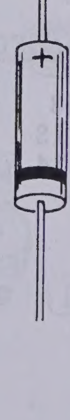
PART No.	PARTS Per Kit	DESCRIPTION
Capacitors (cont'd.)		
⑨ 21-60	1	18 μμf ±5% NPO disc ceramic ✓
21-92	1	68 μμf ±5% NPO disc ceramic ✓
21-14	2	.001 μfd 500 V disc ceramic ✓
21-27	47	.005 μfd 500 V disc ceramic ✓
21-16	32	.01 μfd 500 V disc ceramic ✓
21-72	7	.005 μfd 1.4 kv disc ceramic ✓
21-31	1	.02 μfd 500 V disc ceramic ✓
21-81	3	.1 μfd 50 V disc ceramic ✓
21-29	2	4.7 μμf 500 V tubular ceramic ✓
⑩ 21-102	1	20 μμf N400 flat plate temperature compensating ✓
23-68	1	.05 μfd 100 V tubular paper ✓
⑪ 25-54	4	10 μfd 10 V miniature electrolytic ✓
25-33	1	20 μfd 450 V tubular electrolytic ✓
25-71	2	30 μfd 200 V tubular electrolytic ✓
25-37	1	40-40 μfd 450 V twist prong electrolytic ✓
25-85	1	50 μfd 25 V tubular electrolytic ✓
25-34	2	125 μfd 450 V twist prong electrolytic ✓
26-75	1	4.6-51 μμf variable ✓
26-23	1	9 μμf variable ✓
26-24	1	20 μμf variable ✓
26-74	1	20-200-20-200 μμf 4-section variable ✓
26-80	1	162-452 μμf 2-gang variable ✓
26-77	1	250 μμf variable ✓
⑫ 27-20	1	.4 μfd 100 V mylar molded tubular ✓
⑬ 31-30	2	1.5 to 7 μμf ceramic trimmer ✓
31-31	1	3 to 12 μμf ceramic trimmer ✓
31-27	2	8 to 50 μμf ceramic trimmer ✓
31-35	1	20 to 150 μμf mica trimmer ✓

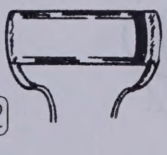


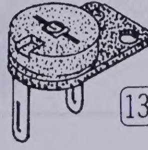












Packaged coil set (#141-23)
Consisting of:

PART No.	PARTS Per Kit	DESCRIPTION
40-356	5	Heterodyne mixer coil ✓
40-357	1	Heterodyne oscillator coil 3.5 megacycles ✓
40-358	1	Heterodyne oscillator coil 10.5 megacycle ✓
40-359	4	Heterodyne oscillator coil 25.5 megacycles ✓
40-360	2	80 meter VFO driver mixer coil ✓
40-361	2	40 meter VFO driver mixer coil ✓
40-362	3	20 meter VFO driver mixer coil ✓
40-363	2	15 meter VFO driver mixer coil ✓
40-364	2	10 meter VFO driver mixer coil ✓
40-407	1	7 megacycle trap ✓
40-433	1	9 megacycle trap ✓

Packaged coil set (#141-24)
Consisting of:

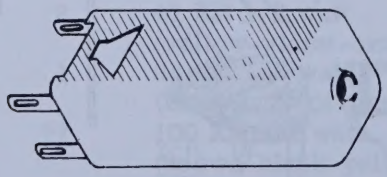
PART No.	PARTS Per Kit	DESCRIPTION
45-3	2	RF choke 1 millihenry ✓
45-4	3	RF choke 1.1 millihenry ✓
45-29	1	RF choke .230 millihenry ✓
45-43	3	RF choke on 47 Ω 1/2 watt (yellow-violet-black) resistor ✓
45-45	2	RF choke parasitic ✓

Coils

PART No.	PARTS Per Kit	DESCRIPTION
40-438	1	VFO oscillator coil 4.9 to 5.5 megacycles ✓
40-366	1	Final tank coil ✓
46-21	1	Swinging choke 5 to 25 henry 25 to 250 milliamperes ✓
46-22	1	Low voltage choke 125 milliamperes ✓

TRANSFORMERS

PART No.	PARTS Per Kit	DESCRIPTION
51-3	1	Audio output ✓
① 52-43	2	IF ✓
54-113	1	Filament 6.3 volts at 1 amp ✓
54-114	1	Power ✓

1


Controls-Switches-Relays

PART No.	PARTS Per Kit	DESCRIPTION
② 10-33	1	200 Ω linear taper control ✓
10-34	1	600 Ω linear taper control ✓
10-69	1	5000 Ω linear taper control ✓
10-31	3	10 KΩ linear taper control ✓
10-32	2	1 megohm linear taper control ✓
10-122	1	1 megohm audio taper control ✓
10-45	1	7.5 megohm linear taper control ✓
11-26	1	10 Ω 2 watt wire-wound control ✓
63-94	1	2-pole 5-position rotary switch (Meter) ✓
63-261	1	5-position 5-section rotary switch (Mode) ✓
63-262	1	5-position 2-section and DPST snap switch rotary switch (Function) ✓
63-263	1	2-position 1-section ceramic rotary switch (Crystal-VFO) ✓
63-264	1	7-position rotary switch (6 assembled and 1 unassembled sections) (Band) ✓
69-6	1	5-pole telephone-type relay ✓

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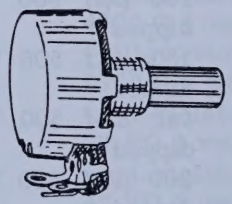

Diodes-Tubes-Lamps

PART No.	PARTS Per Kit	DESCRIPTION
③ 56-4	3	Crystal diode ✓
④ 56-5	2	Crystal silicon diode ✓
⑤ 56-9	1	Encapsulated matched pair diode ✓
⑥ 57-27	2	Silicon diode 500 ma tubular ✓
411-2	1	5U4GB tube ✓
411-11	1	6AU6 tube ✓
411-24	2	12AT7 tube ✓
411-25	1	12AU7 tube ✓
411-40	1	6AL5 tube ✓

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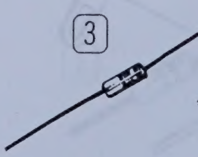

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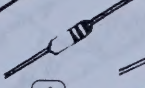

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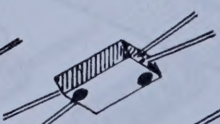

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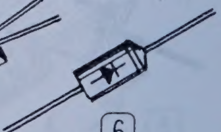
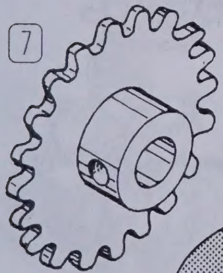


PART No.	PARTS Per Kit	DESCRIPTION
Tubes-Diodes-Lamps (cont'd.)		
411-46	3	OB2 tube ✓
411-59	1	OA2 tube ✓
411-63	1	6CL6 tube ✓
411-67	3	6CB6 tube ✓
411-75	2	6146 tube ✓
411-76	1	5R4GY tube ✓
411-96	1	6AW8 tube ✓
411-124	3	6EA8 tube ✓
412-20	4	#47 pilot lamp ✓
Gears-Shafts-Bushings-Couplings-Pulleys-Flywheel		
⑦ 451-18	2	Right angle drive gear ✓
⑧ 451-28	1	Worm gear (single start brass) fine ✓
⑨ 451-29	1	Worm gear (single start brass) coarse ✓
⑩ 451-30	1	VFO worm drive gear (linen phenolic) ✓
⑪ 451-31	1	Worm drive gear (steel) ✓
453-11	1	1-3/4" insulating extension shaft ✓
453-17	1	1/4" x 9" extension shaft ✓
453-18	2	1/4" x 6-11/16" extension shaft ✓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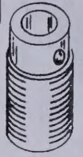
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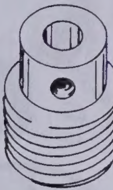
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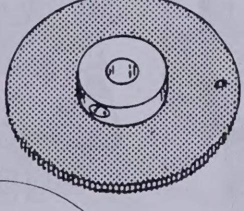
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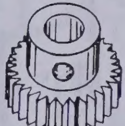
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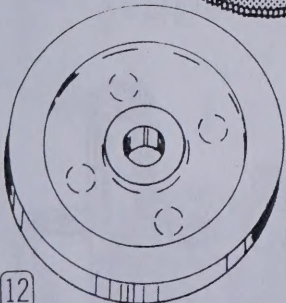
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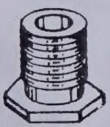
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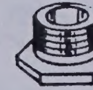
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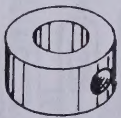
PART No.	PARTS Per Kit	DESCRIPTION
Gears-Shafts-Bushings-Couplings-Pulleys-Flywheel (Cont'd.)		
453-77	1	1/4" x 7" phenolic insulating shaft ✓
453-107	1	1/4" x 15-1/8" extension shaft ✓
⑫ 454-2	1	Flywheel ✓
⑬ 455-9	4	1/4" ID x 3/8" long brass bushing ✓
⑭ 455-13	4	1/4" ID x 1/4" long brass shaft bushing ✓
⑮ 455-15	6	1/4" ID x 1/4" collar ✓
⑯ 455-18	1	1/4" ID x 9/16" long brass bushing ✓
⑰ 456-1	1	Flexible shaft coupling ✓
456-4	1	Insulated shaft coupling ✓
⑱ 456-7	1	Rigid shaft coupling ✓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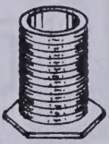
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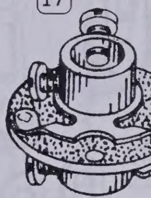
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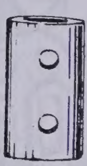
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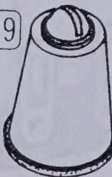
PART No.	PARTS Per Kit	DESCRIPTION
Insulators-Grommets-Clamps-Terminal Strips		
⑲ 71-4	2	Ceramic standoff insulator ✓
⑳ 73-1	2	3/8" rubber grommet ✓
73-2	4	3/4" rubber grommet ✓
㉑ 73-6	3	Shock mount grommet ✓
73-4	16	5/16" rubber grommet ✓
㉒ 75-18	1	Nylon shoulder bushing ✓
㉓ 75-30	1	Line cord strain relief ✓
㉔ 207-3	2	1/8" plastic clamp ✓
207-22	2	1/2" plastic clamp ✓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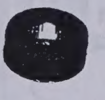
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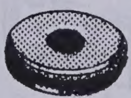
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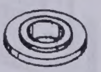
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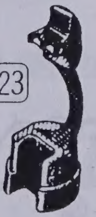
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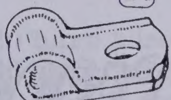
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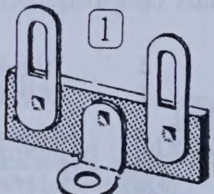
Insulators-Grommets-Clamps-Terminal Strips (Cont'd.)

	PART No.	PARTS Per Kit	DESCRIPTION
1	431-2	2	2-lug terminal strip (no ground) ✓
2	431-5	1	4-lug terminal strip (no ground) ✓
3	431-11	6	5-lug terminal strip ✓
4	431-12	1	4-lug terminal strip ✓
5	431-15	2	1-lug terminal strip (no ground) ✓
6	431-41	1	2-lug high voltage terminal strip (no ground) ✓
7	431-44	1	4-lug high voltage terminal strip ✓
8	431-49	17	11-lug miniature terminal strip (2 extra) ✓

Connectors-Sockets-Jacks-Plugs

	PART No.	PARTS Per Kit	DESCRIPTION
9	432-38	1	Microphone connector, male ✓
10	432-39	1	Microphone connector, female ✓
11	434-20	2	AC receptacle ✓
12	434-34	5	7-pin miniature phenolic tube socket ✓
13	434-35	4	7-pin miniature ceramic tube socket (shielded) ✓
14	434-36	6	9-pin miniature ceramic tube socket (shielded) ✓
15	434-38	1	Crystal socket (phenolic) ✓
16	434-42	4	Phono socket ✓
17	434-44	2	Pilot lamp socket ✓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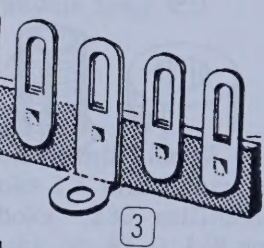
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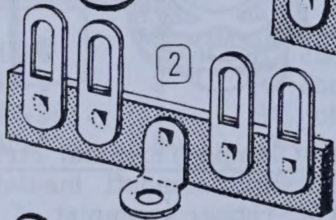
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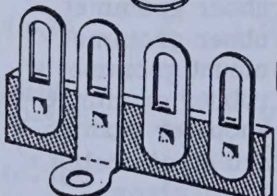
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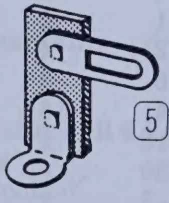
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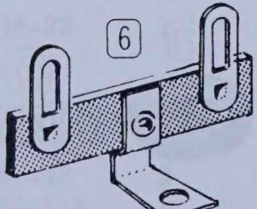
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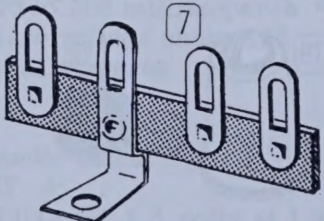
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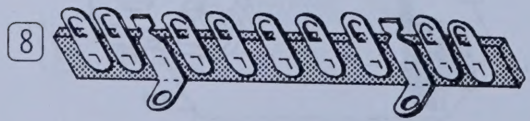
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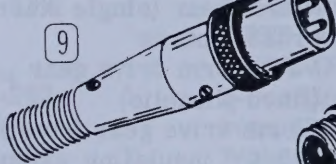
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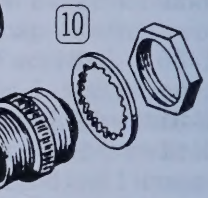
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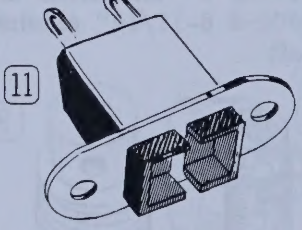
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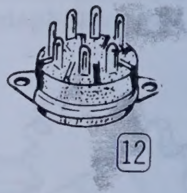
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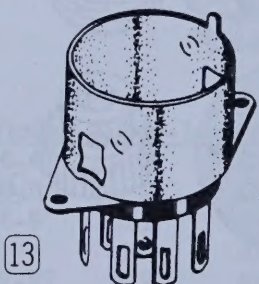
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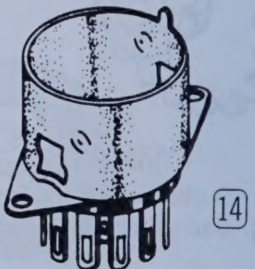
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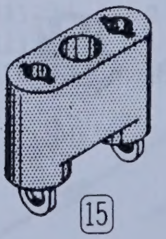
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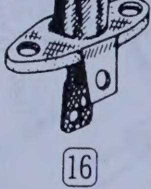
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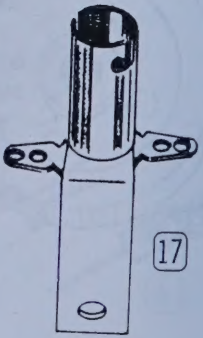
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PART No.	PARTS Per Kit	DESCRIPTION
Connectors-Sockets-Jacks-Plugs (cont'd.)		
① 434-53	4	Octal ceramic tube socket ✓
② 434-56	2	9-pin miniature phenolic tube socket (center shield) ✓
③ 434-58	1	Octal tube socket ✓
④ 434-74	9	Crystal socket (ceramic) ✓
⑤ 434-85	2	Pilot lamp socket (side mount) ✓
⑥ 436-1	1	2-terminal phone jack ✓
⑦ 436-3	1	Red banana jack ✓
⑧ 436-5	1	Coaxial jack ✓
⑨ 436-13	1	3-terminal phone jack ✓
⑩ 437-1	1	Banana jack insert ✓
⑪ 438-4	4	Single prong phono plug ✓
⑫ 438-6	1	Octal plug ✓
⑬ 438-11	1	AC fused plug ✓

PART No.	PARTS Per Kit	DESCRIPTION
Tube Shields-Knobs-Tools		
⑭ 206-3	4	9-pin lock type 1-15/16" tube shield ✓
⑮ 206-25	4	1-3/4" 7-pin tube shield ✓
⑯ 206-43	1	Coaxial shield ✓
⑰ 206-54	2	2-3/8" 9-pin tube shield ✓
462-36	2	Red 3/16" knob ✓
⑱ 462-128	1	2-1/4" knob ✓
462-129	6	1-1/4" knob ✓
462-130	8	11/16" knob ✓
462-158	2	1-3/4" knob ✓
490-1	1	Plastic alignment tool ✓
490-6	1	5/64" allen wrench ✓
490-19	1	1/4" open end wrench ✓

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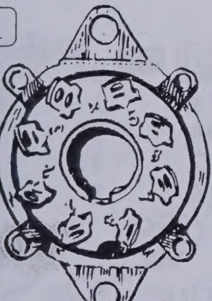
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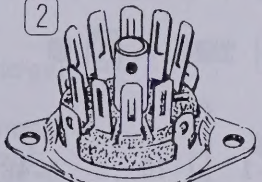
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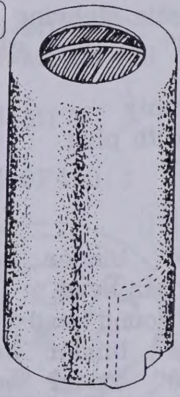
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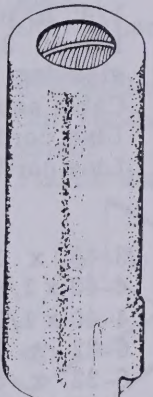
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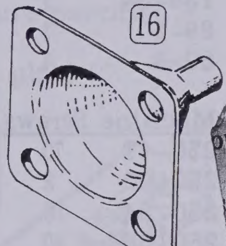
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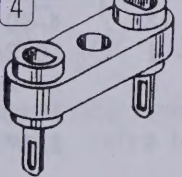
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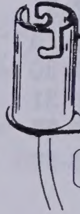
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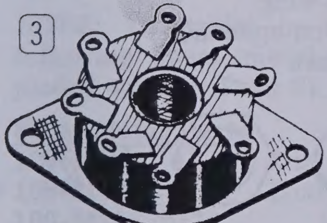
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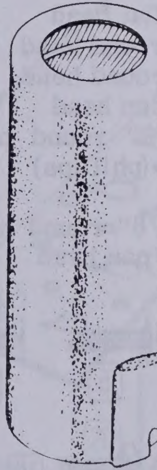
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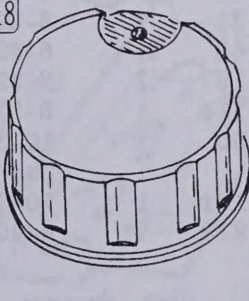
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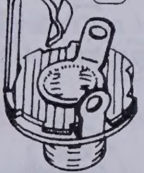
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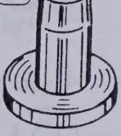
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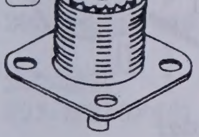
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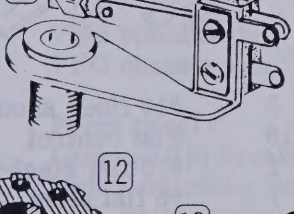
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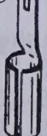
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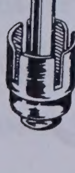
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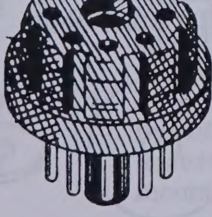
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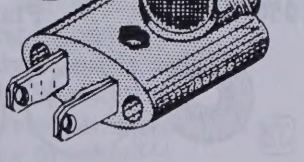


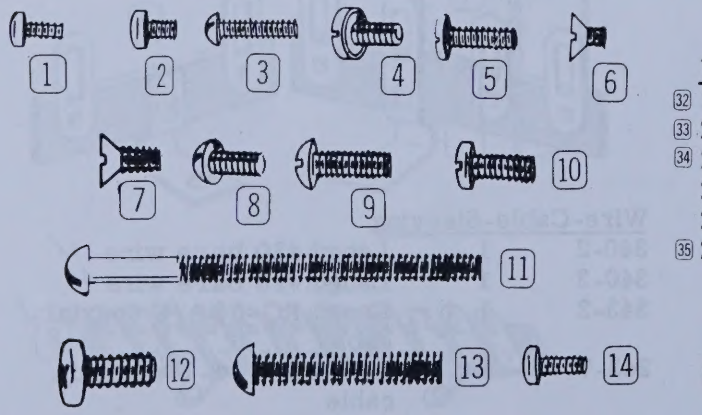
PART No.	PARTS Per Kit	DESCRIPTION
Wire-Cable-Sleeving		
340-2	1	Length #20 bare wire ✓
340-3	1	Length #16 bare wire ✓
343-2	1	Length RG-58A/U coaxial cable ✓
343-7	1	Length RG174-U coaxial cable ✓

Wire-Cable-Sleeving (Cont'd.)

	PART No.	PARTS Per Kit	DESCRIPTION
✓	344-1	1	Length black hookup wire
		1	Length red hookup wire
		1	Length gray hookup wire
		1	Length brown hookup wire
		1	Length green hookup wire
		1	Length orange hookup wire
		1	Length yellow hookup wire
		1	Length blue hookup wire
		1	Length white hookup wire
		1	Length violet hookup wire
	344-13	1	Length blue HV #22 hookup wire
	346-1	4	Length #15 sleeving
	346-2	1	Length 3/16" diameter clear sleeving
	346-5	1	1/4" ID plastic sleeving
	346-10	1	Length 3/8" ID fiber glass sleeving
	134-34	1	Cable assembly
	89-1	1	Line cord with plug
	89-4	1	Line cord ✓

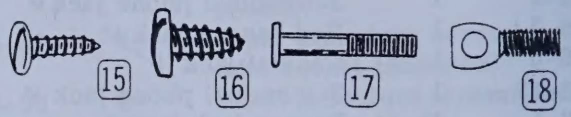
Machine Screws

	PART No.	PARTS Per Kit	DESCRIPTION
1	250-49	70	3-48 x 1/4" binder head
2	250-52	2	4-40 x 1/4" pan head
3	250-34	10	4-40 x 1/2" round head
4	250-56	80	6-32 x 1/4" binder head
5	250-89	52	6-32 x 3/8" binder head
6	250-70	2	6-32 x 3/16" flat head
7	250-32	12	6-32 x 3/8" flat head
8	250-31	1	6-32 x 1/4" round head
9	250-48	14	6-32 x 1/2" round head
10	250-137	12	8-32 x 3/8" pan head
11	250-115	1	8-32 x 2-1/2" round head
12	250-50	13 ✓	10-32 x 3/8" (phillips) pan head
13	250-191	1	10-24 x 1-1/8" round head
14	250-213	4	4-40 x 5/16" pan head



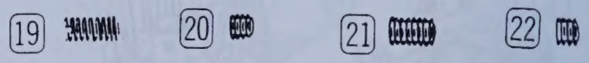
Sheet Metal Screws-Spade Bolts-Stud

	PART No.	PARTS Per Kit	DESCRIPTION
15	250-8	36	#6 x 3/8" pan head sheet metal screw
16	250-51	8	#10 x 3/8" pan head sheet metal screw
17	250-214	1	Mounting stud
18	251-1	8	6-32 spade bolt



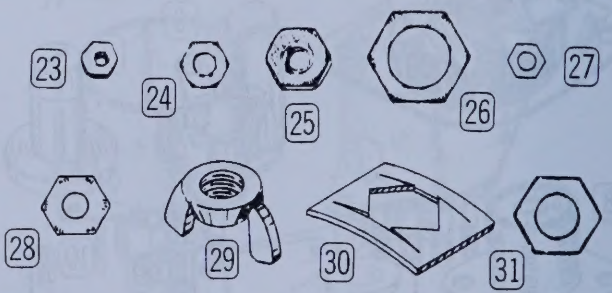
Setscrews

	PART No.	PARTS Per Kit	DESCRIPTION
19	250-28	4	6-32 x 1/4" slotted
20	250-33	4	6-32 x 1/8" slotted ✓
21	250-93	14	8-32 x 1/4" Allen
22	250-105	23	8-32 x 1/8" Allen ✓



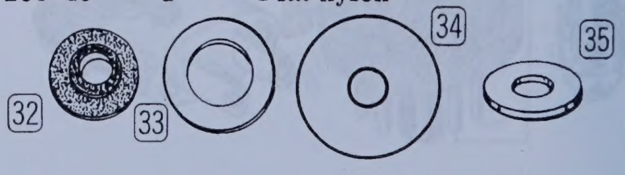
Nuts

	PART No.	PARTS Per Kit	DESCRIPTION
23	252-1	70	3-48
24	252-3	160	6-32 nut
25	252-4	13	8-32
26	252-7	29	Control
27	252-15	12	4-40 x 3/16"
28	252-30	1	10-24 hex
29	252-31	1	10-24 wing
30	252-32	1	Push-on speednut
31	252-57	4	1/4" hex



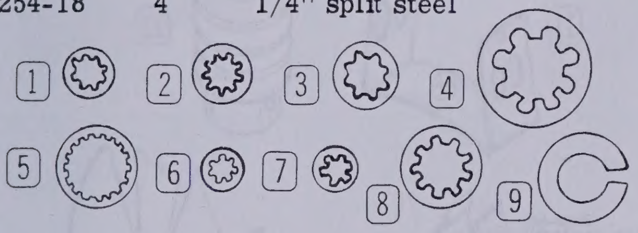
Washers

	PART No.	PARTS Per Kit	DESCRIPTION
32	253-7	2	#10 fiber shoulder
33	253-10	18	Flat control
34	253-19	2	#10 flat steel-thick
	253-25	1	#6 flat steel
	253-42	2	#10 flat steel-thin
35	253-49	1	Flat nylon



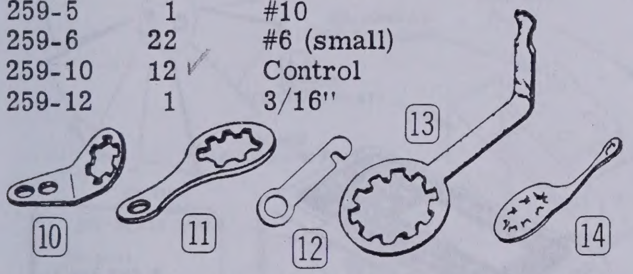
Lockwashers

PART No.	PARTS Per Kit	DESCRIPTION
① 254-1	190	#6
② 254-2	13	#8
③ 254-3	4	#10
④ 254-4	15	Control (regular)
⑤ 254-5	3	Control (thin)
⑥ 254-7	100	#3
⑦ 254-9	18	#4
⑧ 254-14	1	#12
⑨ 254-18	4	1/4" split steel



Solder Lugs

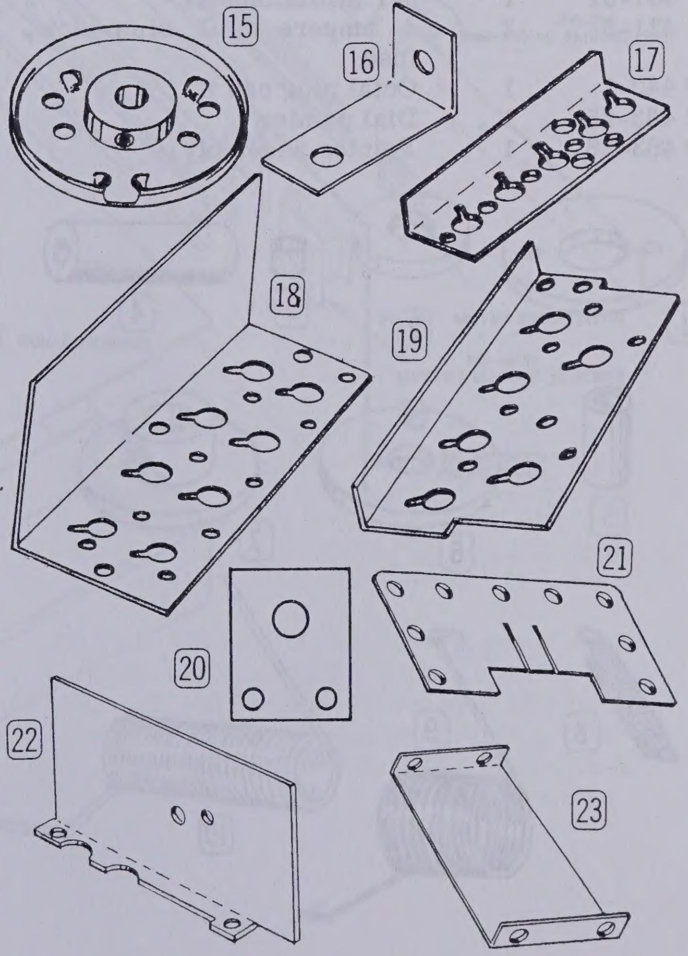
PART No.	PARTS Per Kit	DESCRIPTION
⑩ 259-1	16	#6 (large)
⑪ 259-5	1	#10
⑫ 259-6	22	#6 (small)
⑬ 259-10	12 ✓	Control
⑭ 259-12	1	3/16"



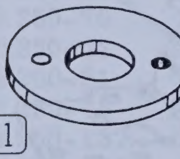
NOTE: To assist in identifying some of the following sheet metal parts, refer to the exploded view on Page 31.

Sheet Metal Parts

PART No.	PARTS Per Kit	DESCRIPTION
100-M131	1	Dial escutcheon ✓
⑮ 100-M165	1	Dial pulley assembly ✓
100-M308F447	1	Chassis base assembly ✓
100-M309F	1	Dial mounting plate assembly ✓
200-M288F449	1	VFO subchassis ✓
202-M39	1	VFO chassis end ✓
203-M230F451	1	Front panel ✓
⑯ 204-M68	2	Lamp shield bracket ✓
204-M158	1	Meter mounting bracket ✓
204-M386	2	Dial plate support bracket ✓
⑰ 204-387	2	Driver and VFO mixer coil mounting bracket ✓
⑱ 204-M389	1	Heterodyne mixer coil mounting bracket ✓
⑲ 204-M390	1	Heterodyne oscillator coil mounting bracket ✓
Sheet Metal Parts (Cont'd.)		
⑳ 204-M391	1	Pulley shaft mounting bracket ✓
205-71F	1	Meter escutcheon ✓
㉑ 205-M87	1	Tube pin shield ✓
205-M284-F448	1	Chassis top plate
205-M285	1	VFO cover ✓
205-291	1	Dial back plate ✓
205-M287F452	1	Front panel escutcheon ✓
206-M163	1	Final amplifier enclosure ✓
206-M164	1	Final amplifier rear plate ✓
206-M165	1	Final amplifier top plate ✓
㉒ 206-M166	1	Crystal filter shield ✓
206-M167	1	Final amplifier partition plate ✓
206-M168	1	Driver partition plate ✓
206-M170F453	1	Coil enclosure ✓
㉓ 206-M171	2	Coil enclosure partition shield ✓
464-9F450	1	Plastic dial plate ✓



	PART No.	PARTS Per Kit	DESCRIPTION
	Miscellaneous		
1	253-52	1	Base stop ✓
2	253-53	2	Stop spacer ✓
3	255-1	14	1/8" spacer
4	255-21	2	7/8" x 5/16" 6-32 spacer
5	255-52	1	13/32" x .250" OD spacer
6	266-59	1	Idler stop ✓
7	266-60	1	Shaft stop ✓
8	258-1	1	Dial cord spring ✓
9	258-51	1	Gear tension spring
10	258-58	1	Dial pulley loading spring
11	260-7	2	IF transformer mounting clips ✓
12	260-12	2	Aluminum anode clip ✓
13	260-29	9	Crystal holder clip ✓
	261-6	4	Rubber mounting feet ✓
14	266-21	1	Fan blade ✓
15	404-90	1	Crystal filter ✓
	420-3	1	Blower motor ✓
16	84-22	1	P.E.C. phase shift network ✓
	90-82	1	Cabinet ✓
	349-3	1	Length dial cord ✓
	407-81	1	0-1 milliammeter ✓
	421-5	2	4 ampere 3AG slow-blow fuse ✓
17	440-1	1	Octal plug cap ✓
18	463-25	1	Dial pointer ✓
19	463-26	1	Pointer assembly ✓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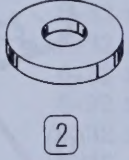
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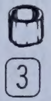
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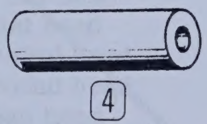
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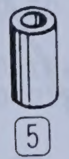
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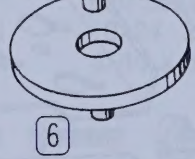
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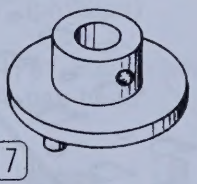
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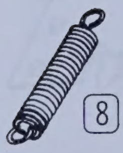
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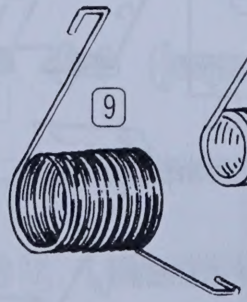
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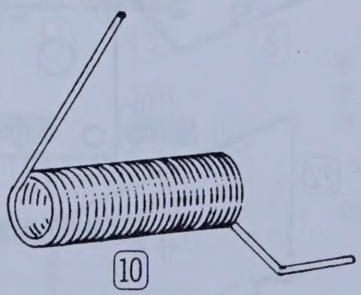
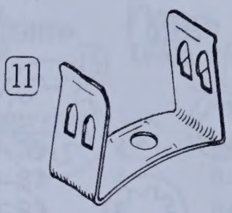

10

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (cont'd.)		
464-18	1	Vernier dial plate ✓
481-1	2	4-prong metal capacitor mounting wafer ✓
481-3	1	4-prong insulated capacitor mounting wafer ✓
331-6		Solder ✓
595-414	1	Manual ✓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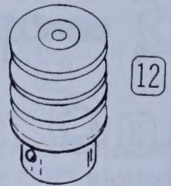
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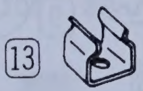
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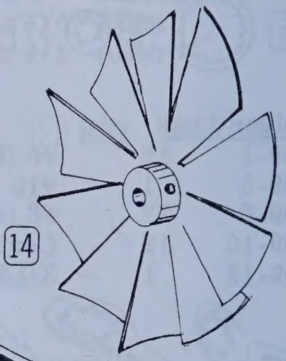
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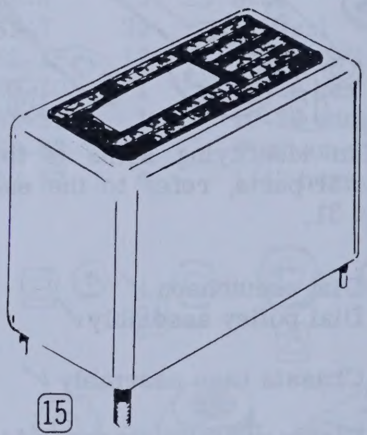
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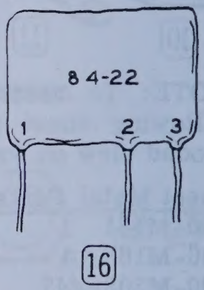

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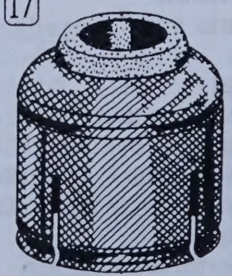
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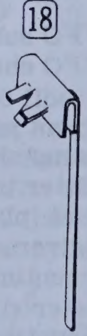
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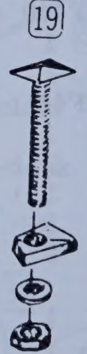
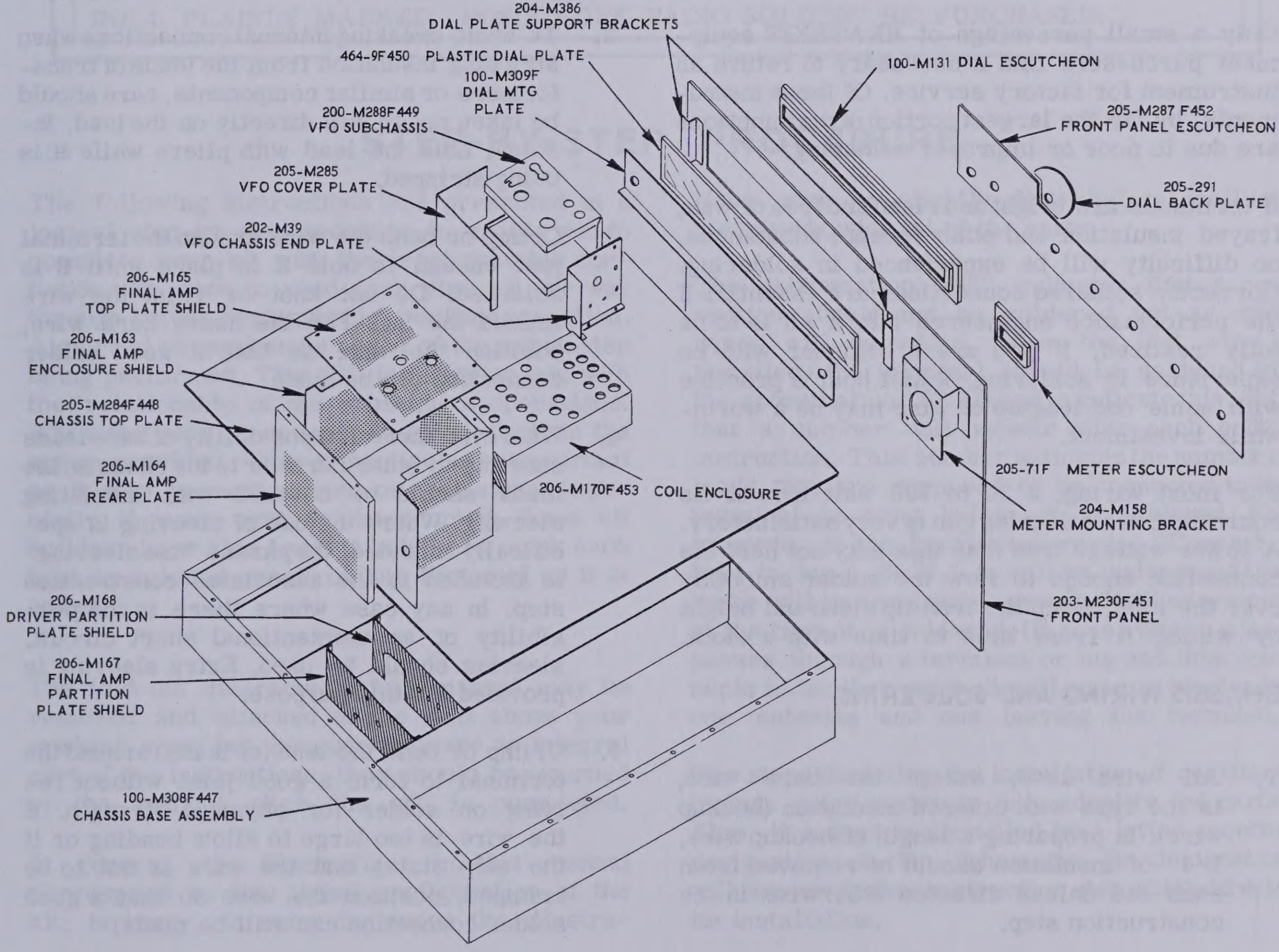
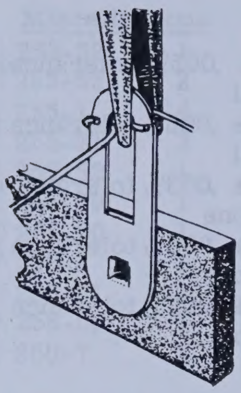

19

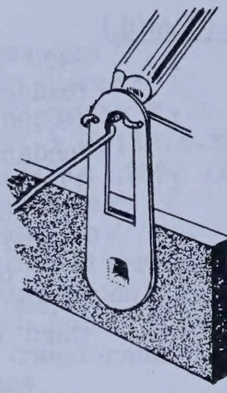
PART No.	PARTS Per Kit	DESCRIPTION
Crystals		
404-91	1	4990 kc ± .003% tolerance fundamental ✓
404-92	1	4010 kc ± .005% tolerance fundamental ✓
404-93	1	13,990 kc ± .003% tolerance fundamental ✓
404-98	1	25,000 kc ± .003% tolerance fundamental ✓
Crystals (Cont'd.)		
404-100	1	3400 kc ± .005% tolerance fundamental ✓
404-101	1	10,400 kc ± .005% tolerance fundamental ✓
404-102	1	17,400 kc ± .003% tolerance third overtone ✓
404-103	1	24,400 kc ± .003% tolerance third overtone ✓
404-104	1	25,600 kc ± .003% tolerance third overtone ✓



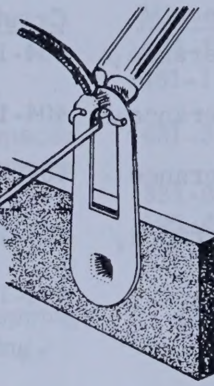
PROPER SOLDERING TECHNIQUES



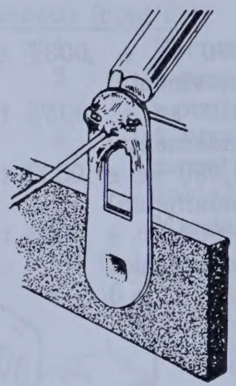
CRIMP WIRES



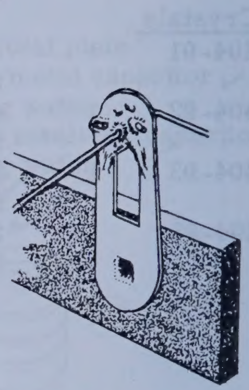
HEAT CONNECTION



APPLY SOLDER



ALLOW SOLDER TO FLOW



PROPER SOLDER CONNECTION

Only a small percentage of HEATHKIT equipment purchasers find it necessary to return an instrument for factory service. Of these instruments, by far the largest portion of malfunctions are due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 30 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly over the joint. Keep the iron tip clean and bright by wiping it from time to time with a cloth.

CHASSIS WIRING AND SOLDERING

1. All wire used, except the bare wire, is the type with colored insulation (hookup wire). In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the construction step.

2. To avoid breaking internal connections when stripping insulation from the leads of transformers or similar components, care should be taken not to pull directly on the lead. Instead, hold the lead with pliers while it is being stripped.

3. Crimp or bend the wire around the terminal just enough to hold it in place until it is soldered. Do not knot or twist the wire around the lug. For the heavy bare wire, position the wire so that a good solder connection can be made.

4. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated construction step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.

5. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the wire is too large to allow bending or if the step states that the wire is not to be crimped, position the wire so that a good solder connection can still be made.

6. Position the work, if possible, so that gravity will help to keep the solder where you want it.

7. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

8. Then place the solder against the heated terminal and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.

9. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little more solder to achieve a smooth bright appearance.

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each lead in colored pencil on the Pictorial as it is added.

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but, because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. (In cases where a lead passes through a terminal or lug and then connects to another point, it will count as two leads, one entering and one leaving the terminal.)

The steps directing the installation of resistors include color codes to help identify the parts. Also, if a part is identified by a letter-number designation on the Schematic, its designation will appear in the construction step which directs its installation.

STEP-BY-STEP ASSEMBLY

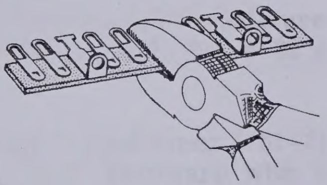
CHASSIS FRAME

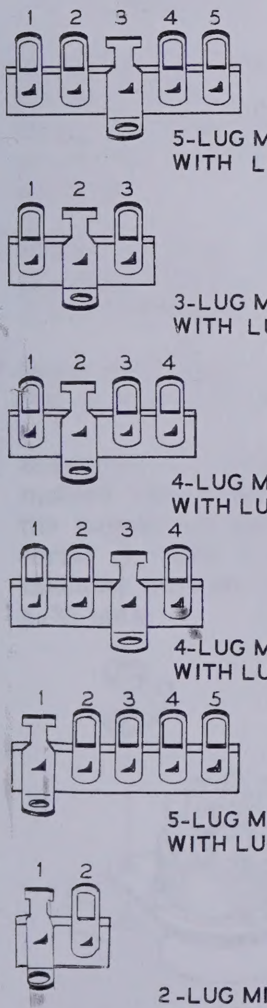
Refer to Pictorial 1 for the following steps.

NOTE: The lug numbering of the terminal strips in this kit is determined by viewing the terminal strip with the mounting foot facing you. The first lug on the left end of the strip is lug 1. This is true for the miniature, regular, and high voltage strips.

(✓) Locate the seventeen 11-lug miniature terminal strips. It will be necessary to cut these terminal strips as directed in the following steps. This can be done by using diagonal cutters. Refer to Details 1A and 1B.

Detail 1A




1 2 3 4 5
5-LUG MINIATURE TERMINAL STRIP WITH LUG #3 GROUND
1 2 3
3-LUG MINIATURE TERMINAL STRIP WITH LUG #2 GROUND
1 2 3 4
4-LUG MINIATURE TERMINAL STRIP WITH LUG #2 GROUND
1 2 3 4
4-LUG MINIATURE TERMINAL STRIP WITH LUG #3 GROUND
1 2 3 4 5
5-LUG MINIATURE TERMINAL STRIP WITH LUG #1 GROUND
1 2
2-LUG MINIATURE TERMINAL STRIP WITH LUG #1 GROUND

Detail 1B

(✓) Prepare one 6-lug miniature terminal strip with #4 lug grounded.

(✓) Prepare ten 5-lug miniature terminal strips with #3 lug grounded.

(✓) Prepare one 3-lug miniature terminal strip with #1 lug grounded.

(✓) Prepare five 3-lug miniature terminal strips with #2 lug grounded.

(✓) Prepare three 4-lug miniature terminal strips with #2 lug grounded.

(✓) Prepare two 4-lug miniature terminal strips with #3 lug grounded.

(✓) Prepare two 5-lug miniature terminal strips with #1 lug grounded.

(✓) Prepare one 2-lug miniature terminal strip with #1 lug grounded.

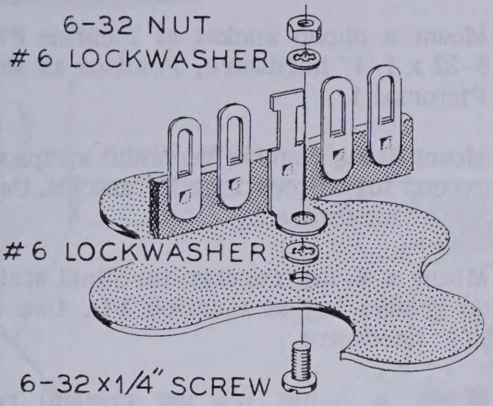
(✓) One 11-lug miniature terminal strip will remain uncut.

(✓) Set the prepared miniature terminal strips aside until they are called for in the following steps.

NOTE: Lockwashers will be used with all screws and nuts when mounting parts unless directed otherwise. Therefore, the following steps will only call out the size and type of hardware to be used. Where 6-32 x 1/4" hardware is specified, a 6-32 x 1/4" binder head machine screw, a #6 lockwasher, and a 6-32 nut should be used. When 3-48 x 1/4" hardware is specified, a 3-48 x 1/4" binder head machine screw, #3 lockwashers, and a 3-48 nut should be used. In the case of terminal strip mountings, an additional lockwasher is to be used under the mounting foot as shown in Detail 1C.

(✓) Position the chassis frame as shown in Pictorial 1.

(✓) Referring to Detail 1C, mount 5-lug (#3 lug ground) miniature terminal strips at locations AF, AG, AH, and AJ. Use 6-32 x 1/4" hardware.



Detail 1C

(✓) Similarly, mount 5-lug (#3 lug ground) miniature terminal strips at locations AW and AX. Use 6-32 x 1/4" hardware.

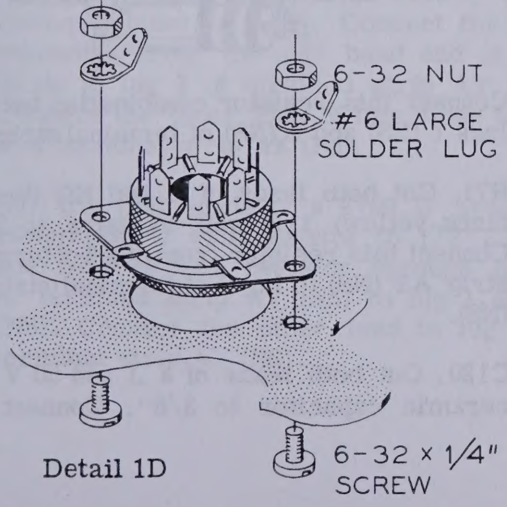
(✓) Mount a 6-lug (#4 lug ground) miniature terminal strip at location AY. Use 6-32 x 1/4" hardware.

(✓) Mount the audio output transformer (#51-3) at BA. Use 6-32 x 3/8" hardware with a large #6 solder lug on one mounting foot as shown. Position the transformer leads as shown.

(✓) Mount a 2-lug ungrounded high voltage terminal strip at location AT. Use 6-32 x 1/4" hardware.

(✓) Mount a #6 large solder lug at location AU. Use a 6-32 x 1/4" screw and a 6-32 nut.

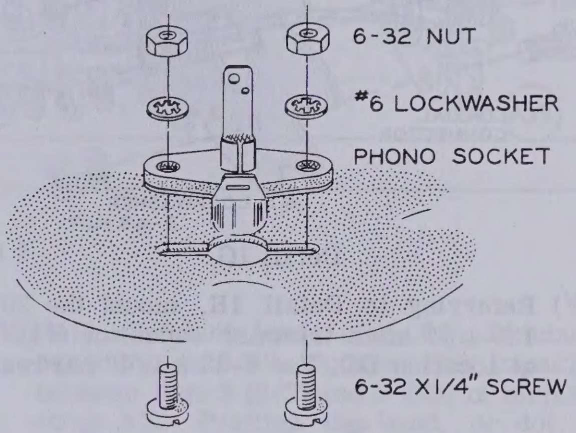
(✓) Referring to Detail 1D, mount the octal molded tube socket at location AP. Place the keyway as shown by the arrow in Pictorial 1. Use 6-32 x 1/4" binder head machine screws, large #6 solder lugs, and 6-32 nuts.



Detail 1D

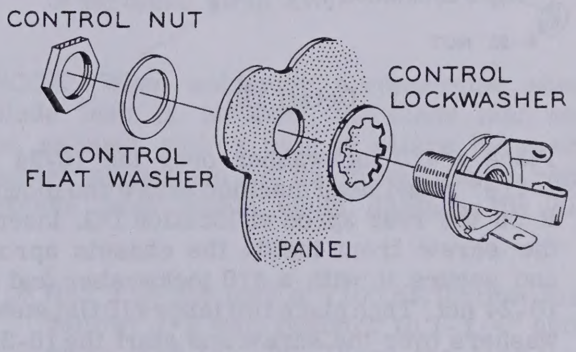
(✓) Mount a 117 volt AC receptacle at location AQ. Use 6-32 x 1/4" hardware.

(✓) Referring to Detail 1E, mount a phono socket at location AR. Use 6-32 x 1/4" hardware. Position as shown.



Detail 1E

(✓) Referring to Detail 1F, mount the FSK phone jack at location AS. Position the lugs as shown in Pictorial 1. Use a regular control lockwasher on the bushing, and secure the jack in place with a control flat washer and control nut on the rear apron.

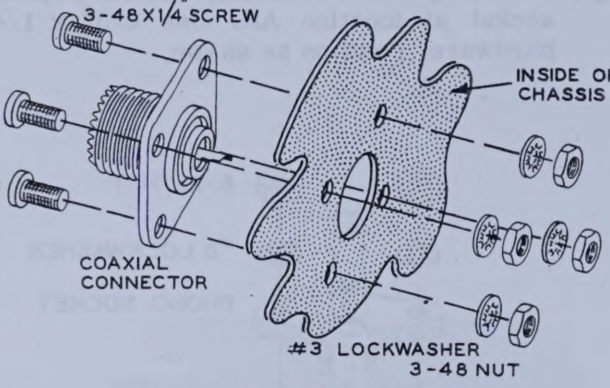


Detail 1F

(✓) Install 5/16" rubber grommets at locations AE, AL, AM, AN, FT, FR, FP, and FM.

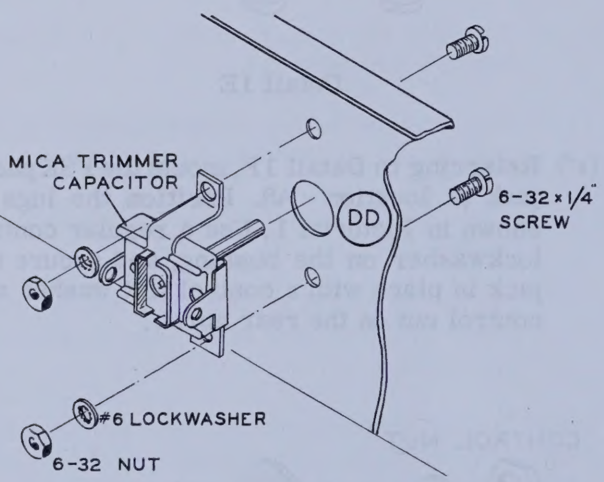
(✓) Mount a phono socket at location DF. Use 6-32 x 1/4" hardware. Position as shown.

(✓) Referring to Detail 1G, mount the coaxial jack at location DE. Use 3-48 x 1/4" hardware.



Detail 1G

(✓) Referring to Detail 1H, mount the 20 to 150 $\mu\mu$f mica trimmer capacitor (#31-35) at location DD. Use 6-32 x 1/4" hardware.



Detail 1H

(✓) Place a #10 lockwasher over the 10-24 x 1-1/8" round head machine screw and mount it on the rear apron at location DG. Insert the screw from inside the chassis apron and secure it with a #10 lockwasher and a 10-24 nut. Then place two large #10 flat steel washers over the screw and start the 10-24 wing nut onto the screw.

(✓) Mount a 4-lug (#2 lug ground) regular terminal strip at location DC. Use 6-32 x 1/4" hardware.

(✓) Mount the coaxial shield at location FQ. Use 3-48 x 1/4" hardware.

(✓) Mount a phono socket at location FL. Use 6-32 x 1/4" hardware. Position as shown in Pictorial 1.

(✓) Mount 2-lug regular terminal strips with no ground lug at locations FJ and FH. Use 6-32 x 1/4" hardware.

(✓) Mount a 4-lug regular terminal strip with no ground lug at location FG. Use 6-32 x 1/4" hardware.

(✓) Mount a 5-lug (#3 lug ground) regular terminal strip at location FE. Use 6-32 x 1/4" hardware.

(✓) Mount a 1-lug vertical regular terminal strip with no ground lug at location FC. Use 6-32 x 1/4" hardware.

Refer to Pictorial 2 for the following steps.

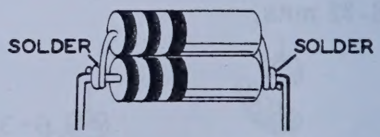
NOTE: When connecting a length of hookup wire, each end of the wire should be stripped 3/8" unless specified otherwise in the step. Place all components near the terminal strips as close to the chassis as possible.

(✓) C114. Cut both leads of a .02 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 6 (NS) of terminal strip AY.

(✓) R104. Cut both leads of a 470 KΩ (yellow-violet-yellow) 1/2 watt resistor to 1/2". Connect this resistor between lugs 3 (NS) and 4 (S-2) of terminal strip AY.

(✓) R67A, R67B. Referring to Detail 2A, prepare two 75 KΩ (violet-green-orange) 2 watt resistors.

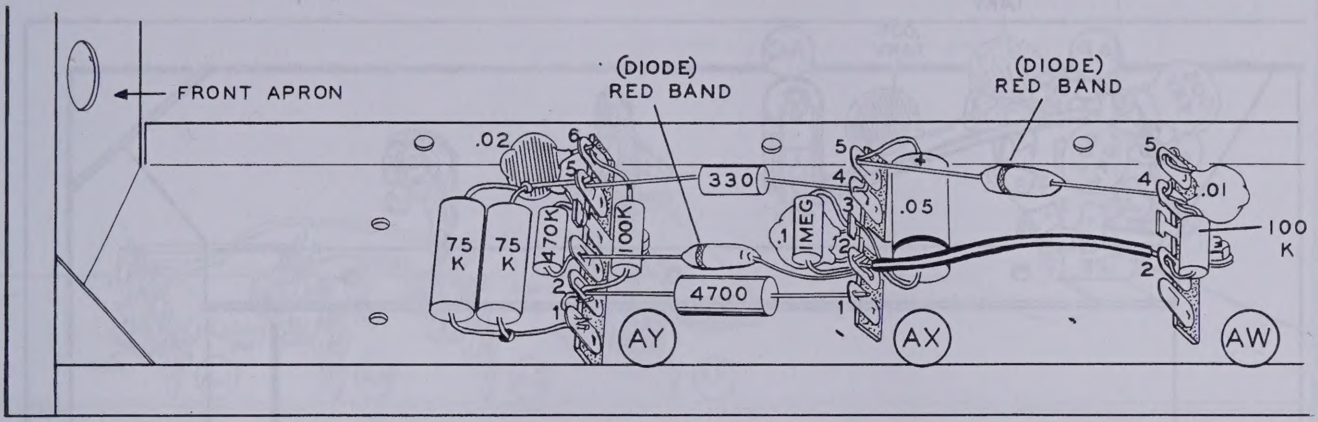
Detail 2A



(✓) Connect this resistor combination between lugs 1 (NS) and 5 (NS) of terminal strip AY.

(✓) R71. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/4". Connect this resistor from lug 6 of terminal strip AY (NS) to lug 2 of terminal strip AY (NS).

(✓) C120. Cut both leads of a .1 μfd 50 V disc ceramic capacitor to 3/8". Connect this



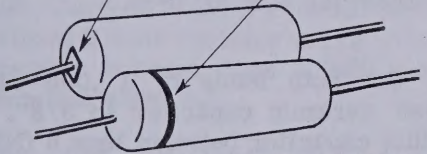
Pictorial 2

capacitor between lugs 2 (NS) and 3 (NS) of terminal strip AX.

(✓) R105. Cut both leads of a 1 megohm (brown-black-green) 1/2 watt resistor to 1/2". Connect this resistor between lugs 2 (NS) and 3 (NS) of terminal strip AX.

(✓) R66. Cut both leads of a 330 Ω (orange-orange-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 5 of terminal strip AY (NS) to lug 4 of terminal strip AX (NS).

NOTE: MARKING ON TUBULAR CAPACITOR EITHER SHOULDER OR BAND



MARKED END MUST BE PLACED AS SHOWN IN THE PICTORIAL

(✓) CR4. Cut both leads of a silicon diode (red-red-blue) to 1/2". Connect the lead extending from the red band end of this diode to lug 3 of terminal strip AY (NS). Connect the other lead of this diode to lug 2 of terminal strip AX (NS).

(✓) R7. Cut both leads of a 4700 Ω (yellow-violet-red) 1 watt resistor to 1/2". Pass one lead of this resistor through lug 2 of terminal strip AY (NS) to lug 1 of AY (NS). Connect the other lead to lug 1 of terminal strip AX (NS).

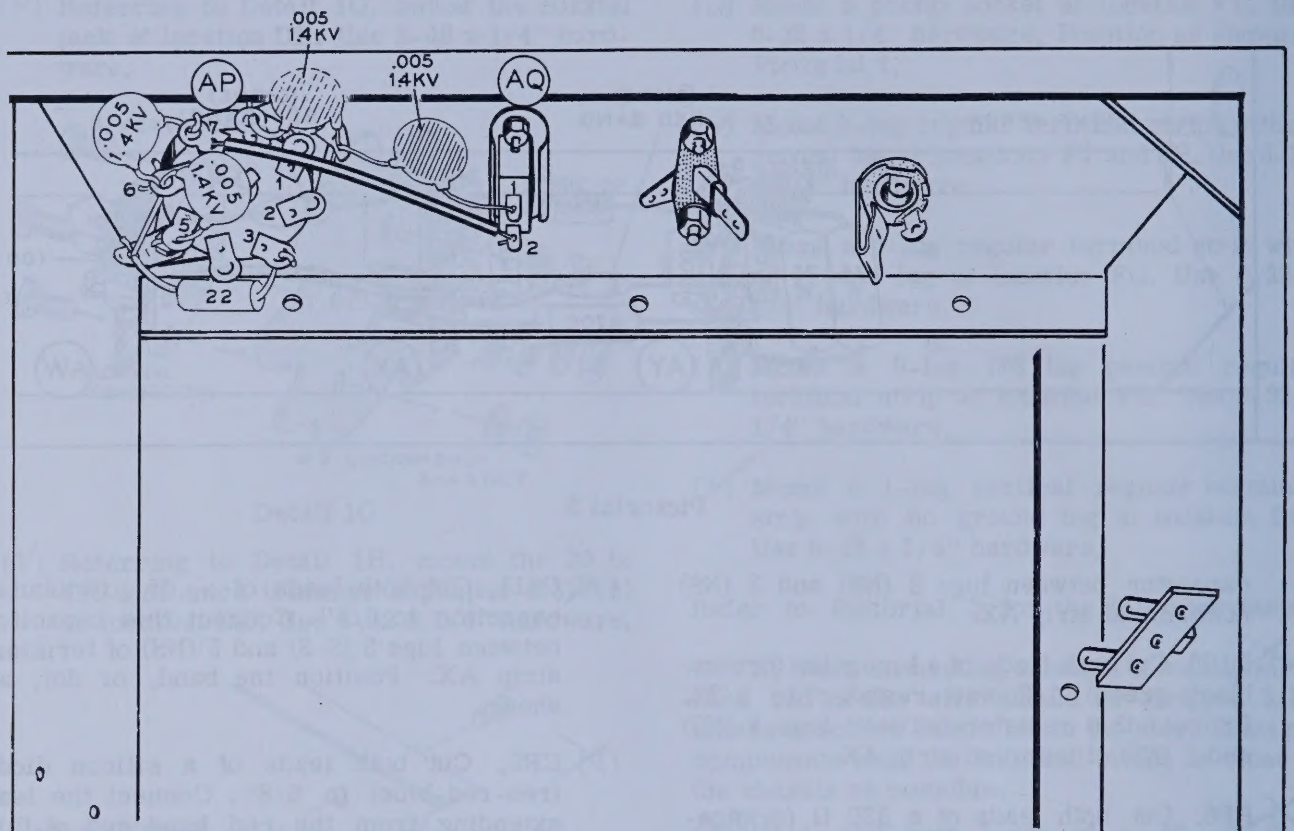
(✓) C111. Cut both leads of a .05 μfd tubular capacitor to 5/8". Connect this capacitor between lugs 3 (S-3) and 5 (NS) of terminal strip AX. Position the band, or dot, as shown.

(✓) CR3. Cut both leads of a silicon diode (red-red-blue) to 5/8". Connect the lead extending from the red band end of this diode to lug 5 of terminal strip AX (NS). Connect the other lead of this diode to lug 4 of terminal strip AW (NS).

(✓) C110. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 5 (NS) of terminal strip AW.

NOTE: When soldering a connection where a diode lead is involved, the diode lead should be gripped with a pair of pliers between the solder connection and the diode body to remove excess heat which could damage the diode.

(✓) R63. Cut one lead of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1-1/4" and the other lead to 1/2". Place the long lead of this resistor through lug 2 of terminal strip AW (NS) and connect it to lug 2 of terminal strip AX (S-4). Use sleeving on this lead. Now solder lug 2 of AW (S-2). Connect the other lead of this resistor to lug 4 of terminal strip AW (S-3).



Pictorial 3

Refer to Pictorial 3 for the following steps.

NOTE: When bare wire is called for in the steps, use the #20 unless the heavy #16 bare wire is mentioned specifically.

(✓) Connect a length of bare wire from lug 2 of AC receptacle AQ (NS) to lug 7 of octal socket AP (NS). Use sleeving.

(✓) C141. Cut both leads of a .005 µfd 1.4 kv disc ceramic capacitor to 1/2". Connect this capacitor from lug 1 of AC receptacle AQ (NS) to the solder lug nearest lug 1 of octal socket AP (NS).

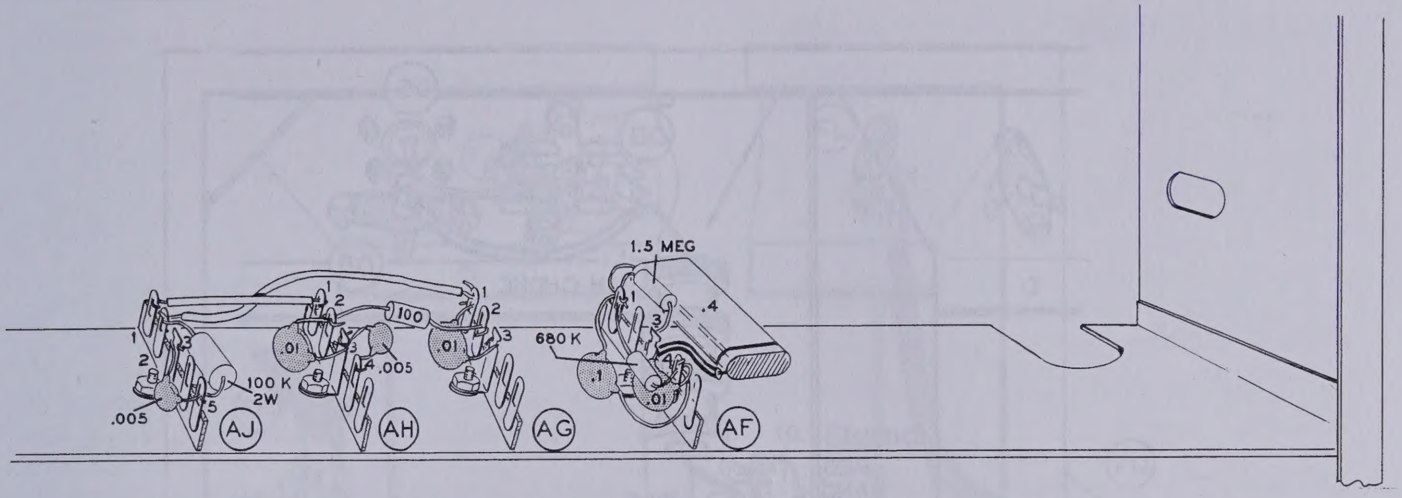
(✓) C142. Cut both leads of a .005 µfd 1.4 kv disc ceramic capacitor to 3/8". Connect this capacitor from lug 8 of octal socket AP (NS) to the solder lug nearest lug 1 of AP (S-2).

(✓) Connect a length of #16 bare wire from lug 6 of octal socket AP (NS) to the solder lug nearest lug 4 of AP (NS).

(✓) C143. Cut both leads of a .005 µfd 1.4 kv disc ceramic capacitor to 3/8". Connect this capacitor between lugs 6 (NS) and 7 (NS) of octal socket AP.

(✓) C144. Cut both leads of another .005 µfd 1.4 kv disc ceramic capacitor to 3/8". Connect this capacitor between lugs 5 (NS) and 6 (S-3) of octal socket AP.

(✓) R59. Cut both leads of a 22 Ω (red-red-black) 1 watt resistor to 1/2". Connect this resistor from lug 3 of octal socket AP (NS) to the solder lug nearest lug 4 of AP (S-2).



Pictorial 4

Refer to Pictorial 4 for the following steps.

(✓) Connect a 2-3/4" length of red hookup wire from lug 2 of terminal strip AJ (NS) to lug 1 of terminal strip AG (NS).

(✓) Connect a 1-1/2" length of gray hookup wire from lug 1 of terminal strip AJ (NS) to lug 1 of terminal strip AH (NS).

(✓) C150A. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (S-1) and 5 (NS) of terminal strip AJ.

(✓) R92. Cut both leads of a 100 KΩ (brown-black-yellow) 2 watt resistor to 1/2". Connect this resistor between lugs 2 (NS) and 5 (NS) of terminal strip AJ.

(✓) C68. Cut both leads of a .4 μfd 100 V mylar tubular capacitor to 3/4". Connect this capacitor between lug 1 (NS) and the eyelet of lug 3 (S-1) of terminal strip AF. Use sleeving on the lead to lug 3. Position the marked ground end of the capacitor as shown in Pictorial 4.

(✓) C66. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of terminal strip AF.

(✓) C161. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor between lugs 1 (NS) and 3 (S-1) of terminal strip AG.

(✓) C67. Cut both leads of a .1 μfd 50 V disc ceramic capacitor to 1/2". Connect this capacitor between lugs 1 (NS) and 4 (NS) of terminal strip AF.

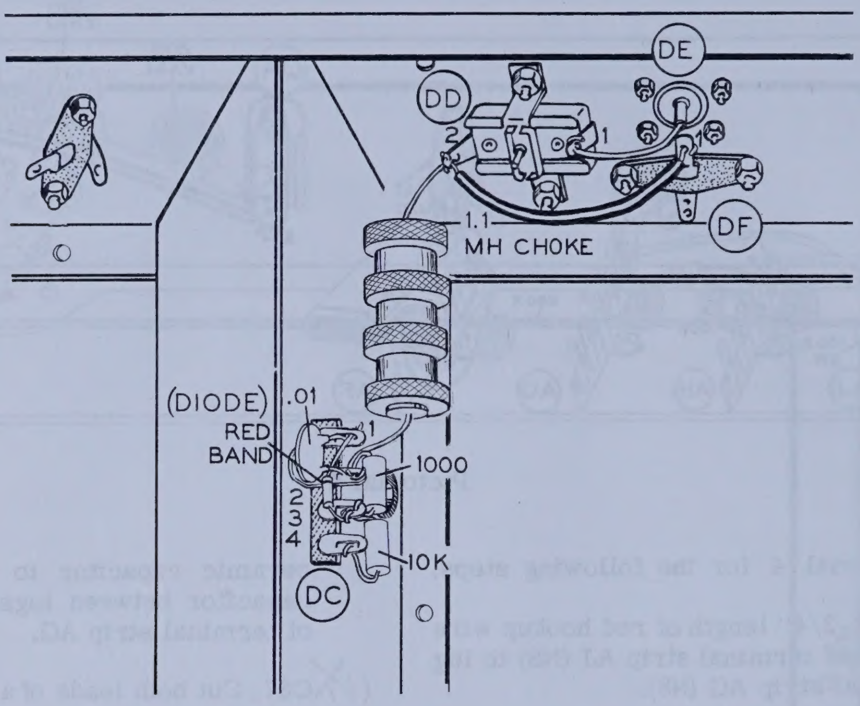
(✓) R41. Cut both leads of a 1.5 megohm (brown-green-green) 1/2 watt resistor to 3/8". Connect this resistor between lugs 1 (NS) and 3 (S-2) of terminal strip AF. 3.3

(✓) R40. Cut both leads of a 680 KΩ (blue-gray-yellow) 1/2 watt resistor to 1/2". Connect this resistor between lugs 1 (NS) and 4 (NS) of terminal strip AF.

(✓) C160. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of terminal strip AH.

(✓) C167. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (S-2) and 4 (NS) of terminal strip AH.

(✓) R22. Cut both leads of a 100 Ω (brown-black-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of terminal strip AG (NS) to lug 2 of terminal strip AH (NS).



Pictorial 5

Refer to Pictorial 5 for the following steps.

(✓) Connect one end of a 2-1/4" length of #16 bare wire to center lug 1 of phono socket DF (S-1). Place a 1-3/4" length of sleeving over this wire and connect the other end to lug 2 of trimmer capacitor DD (NS). Form this wire as shown in Pictorial 5.

(✓) Connect a 1-1/4" length of #16 bare wire from coaxial jack DE (S-1) to lug 1 of trimmer capacitor DD (NS).

(✓) C107. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor between lugs 1 (NS) and 2 (NS) of terminal strip DC.

(✓) R58. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 1/2". Connect this resistor between lugs 2 (NS) and 3 (NS) of terminal strip DC.

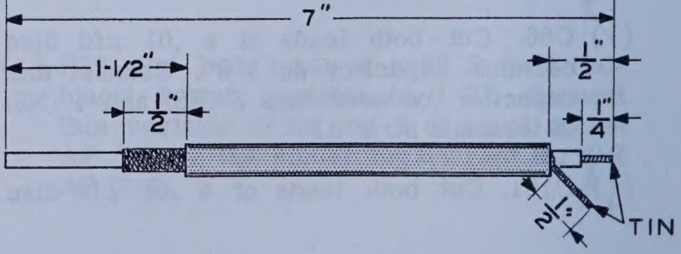
(✓) R57. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 1/2". Connect this resistor between lugs 3 (NS) and 4 (NS) of terminal strip DC.

(✓) RFC7. Cut one lead of a 1.1 mh RF choke (#45-4) to 1" and the other lead to 3/4". Connect the 3/4" lead of this RF choke to lug 2 of terminal strip DC (S-3). Connect the other lead to lug 2 of trimmer capacitor DD (S-2). Position as shown in Pictorial 5.

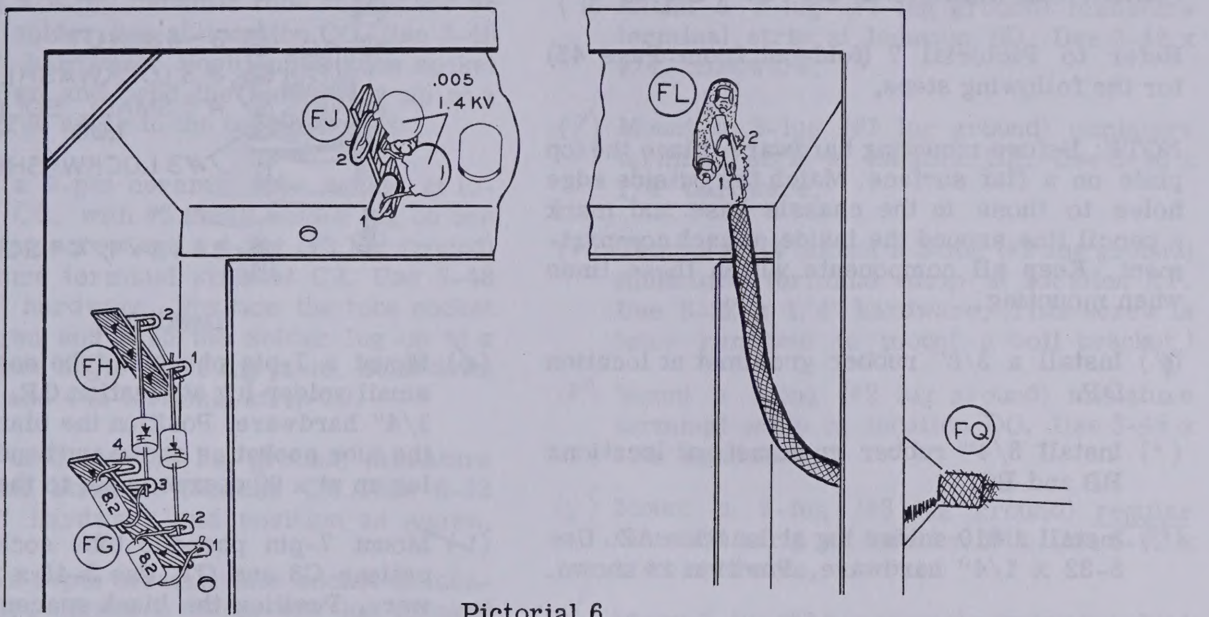
(✓) CR7. Cut both leads of a crystal diode (red-green-violet) to 3/4". Connect the lead extending from the red band end of the diode to lug 1 of terminal strip DC (NS). Connect the other lead of this diode to lug 3 of terminal strip DC (S-3).

Refer to Pictorial 6 for the following steps.

(✓) Referring to Detail 6A, prepare a 7" length of RG58A/U coaxial cable.

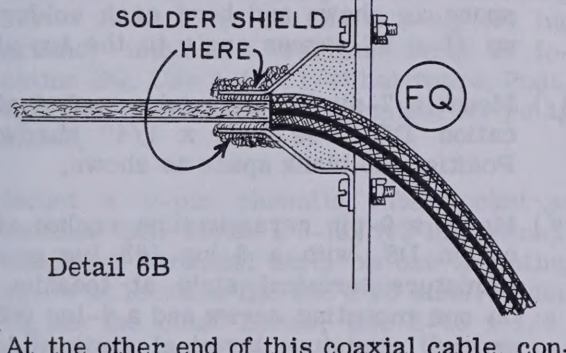


Detail 6A



Pictorial 6

(✓) Using the procedure shown in Detail 6B, install the coaxial cable on the coaxial shield, at location FQ. Use care when soldering the shield of the coaxial cable to the coaxial shield, as overheating of the center conductor will cause the insulation on the inner conductor to melt and produce a short circuit.



Detail 6B

(✓) At the other end of this coaxial cable, connect the inner conductor to lug 1 of phono socket FL (S-1). Connect the shield lead of this cable to lug 2 of FL (S-1).

(✓) C134. Cut both leads of a .005 μfd 1.4 kv disc ceramic capacitor to 3/8". Connect this capacitor between lug 1 (NS) and the eyelet in the mounting foot (NS) of terminal strip FJ.

(✓) C135. Cut both leads of another .005 μfd 1.4 kv disc ceramic capacitor to 3/8". Connect this capacitor between the eyelet in the mounting foot (S-2) and lug 2 (NS) of terminal strip FJ.

(✓) R107. Cut both leads of an 8.2 Ω (gray-red-gold) 1/2 watt resistor to 1/2". Connect this resistor between lugs 1 (NS) and 2 (NS) of terminal strip FG.

(✓) R108. Cut both leads of another 8.2 Ω (gray-red-gold) 1/2 watt resistor to 1/2". Connect this resistor between lugs 3 (NS) and 4 (NS) of terminal strip FG.

(✓) CR5. Cut both leads of a 500 ma tubular silicon diode (#57-27) to 1/2". Connect the positive (▶|±) lead to lug 2 of terminal strip FG (S-2). Connect the other end of this diode to lug 1 of terminal strip FH (NS).

(✓) CR6. Cut the positive (▶|±) lead of another 500 ma tubular silicon diode to 1/2". Connect this lead to lug 3 of terminal strip FG (S-2). Place the other lead of this diode through lug 2 (NS) and connect it to lug 1 (NS) of terminal strip FH. Now solder lug 2 of FH (S-2). Cut off any excess lead length.

NOTE: Crimp all leads that remain unsoldered to prevent them from coming loose as the chassis is moved.

This completes the wiring of the chassis frame assembly. Set this assembly aside until called for later.

HARDWARE MOUNTING ON TOP PLATE

Refer to Pictorial 7 (fold-out from Page 45) for the following steps.

NOTE: Before mounting hardware, place the top plate on a flat surface. Match the outside edge holes to those in the chassis base and mark a pencil line around the inside of each compartment. Keep all components within these lines when mounting.

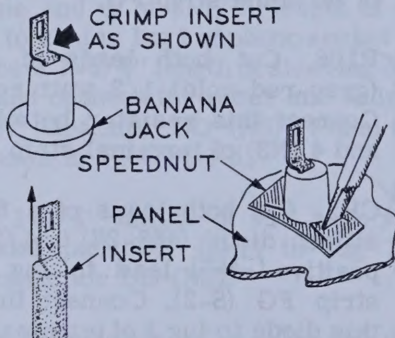
(✓) Install a 3/8" rubber grommet at location DP.

(✓) Install 3/4" rubber grommets at locations BB and BC.

(✓) Install a #10 solder lug at location AZ. Use 6-32 x 1/4" hardware. Position as shown.

(✓) Install 5/16" rubber grommets at locations BE, DX, DYA, DYB, EB, and GB.

(✓) Locate the red banana jack and the banana jack insert. Referring to Detail 7A, mount the red banana jack at location DN and install the banana jack insert. Use the push-on speednut.

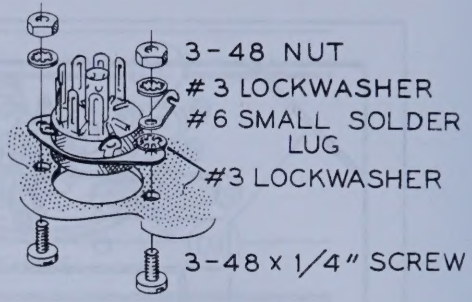


Detail 7A

(✓) Mount an AC receptacle at location CW. Use 6-32 x 1/4" hardware.

NOTE: When mounting a small solder lug or miniature terminal strip on the tube socket hardware, a #3 lockwasher is used above and below the mounting foot.

(✓) Referring to Detail 7B, mount a 7-pin phenolic tube socket and #6 small solder lug at location BJ. Position the blank space of the tube socket as shown in Pictorial 7, and bend the solder lug up at a 90 degree angle to the top plate.



Detail 7B

(✓) Mount a 7-pin phenolic tube socket and #6 small solder lug at location CR. Use 3-48 x 1/4" hardware. Position the blank space of the tube socket as shown and bend the solder lug up at a 90 degree angle to the top plate.

(✓) Mount 7-pin phenolic tube sockets at locations CS and CT. Use 3-48 x 1/4" hardware. Position the blank spaces as shown.

(✓) Mount another 7-pin phenolic tube socket and #6 small solder lug at location CU. Use 3-48 x 1/4" hardware. Position the blank space as shown and bend the solder lug up at a 90 degree angle to the top plate.

(✓) Mount a 7-pin ceramic tube socket and two #6 small solder lugs at location BW. Use 3-48 x 1/4" hardware. Position the blank space as shown and bend each solder lug up at a 90 degree angle to the top plate.

(✓) Mount a 7-pin ceramic tube socket at location DQ. Use 3-48 x 1/4" hardware. Position the blank space as shown.

(✓) Mount a 9-pin ceramic tube socket at location DS, with a 5-lug (#3 lug ground) miniature terminal strip at location DR on one mounting screw and a 4-lug (#2 lug ground) miniature terminal strip at location DT on the other screw. Use 3-48 x 1/4" hardware. Position the tube socket and terminal strips as shown.

(✓) Mount a 9-pin ceramic tube socket at location DM, with a #6 small solder lug on one mounting screw and a 5-lug (#3 lug ground) miniature terminal strip at location DL. Use 3-48 x 1/4" hardware. Position the tube socket and terminal strip as shown and bend the solder lug up at a 90 degree angle to the top plate.

(✓) Mount a 9-pin ceramic tube socket and #6 small solder lug at location CO. Use 3-48 x 1/4" hardware. Position the tube socket as shown and bend the solder lug up at a 90 degree angle to the top plate.

(✓) Mount a 9-pin ceramic tube socket at location CC, with #6 small solder lug on one mounting screw and a 4-lug (#3 lug ground) miniature terminal strip at CJ. Use 3-48 x 1/4" hardware. Position the tube socket as shown and bend the solder lug up at a 90 degree angle to the top plate. Bend down lugs 3 and 4 of terminal strip CJ.

(✓) Mount a 3-lug (#2 lug ground) miniature terminal strip at location CE. Use 6-32 x 1/4" hardware and position as shown.

(✓) Mount a 9-pin ceramic tube socket at location CF. Mount a 3-lug (#2 lug ground) miniature terminal strip at location CG on one mounting screw, and a 4-lug (#3 lug ground) miniature terminal strip at location BZ. Use 3-48 x 1/4" hardware. Position the tube socket and terminal strips as shown.

(✓) Mount a 9-pin ceramic tube socket at location BP. Secure a 4-lug (#2 lug ground) miniature terminal strip on one mounting screw at location BO and a 5-lug (#1 lug ground) miniature terminal strip at location BQ. Use 3-48 x 1/4" hardware. Position the tube socket and terminal strips as shown.

(✓) Mount a 9-pin phenolic tube socket at location BN. Mount a 3-lug (#2 lug ground) miniature terminal strip on one mounting screw at location BM and a #6 small solder lug on the other screw. Use 3-48 x 1/4" hardware. Position the tube socket and terminal strip as shown, and bend the solder lug up at a 90 degree angle to the top plate.

(✓) Mount another 9-pin phenolic tube socket at location BH. Secure one end of the 11-lug terminal strip at the mounting screw of tube socket BH. Use 3-48 x 1/4" hardware. Position the terminal strip and tube socket as shown. Bend the ground lug nearest lug 8 of tube socket BH down against the chassis.

(✓) Secure the other end of this 11-lug terminal strip, BF, with 3-48 x 1/4" hardware.

(✓) Mount a 5-lug (#1 lug ground) miniature terminal strip at location BD. Use 3-48 x 1/4" hardware.

(✓) Mount a 3-lug (#1 lug ground) miniature terminal strip at location DH. Use 3-48 x 1/4" hardware.

(✓) Temporarily mount a 5-lug (#3 lug ground) miniature terminal strip at location EP. Use 6-32 x 1/4" hardware. (This screw is later removed to mount a coil bracket.)

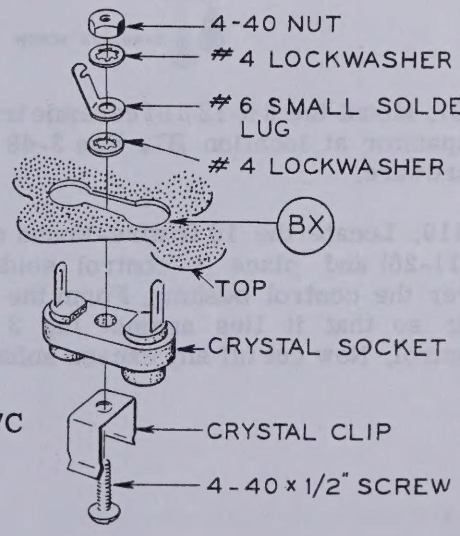
(✓) Mount a 3-lug (#2 lug ground) miniature terminal strip at location DO. Use 3-48 x 1/4" hardware.

(✓) Mount a 5-lug (#3 lug ground) regular terminal strip at location DU. Use 6-32 x 1/4" hardware.

(✓) Mount 5-lug (#3 lug ground) regular terminal strips at locations FV, FW, FX, and FY. Use 6-32 x 1/4" hardware.

(✓) Mount ceramic octal tube sockets at locations DV, DW, GJ, and GK. Use 6-32 x 3/8" flat head machine screws, #6 lockwashers, and 6-32 nuts. Orient the keyway in the sockets as shown by the arrows in Pictorial 7.

(✓) Referring to Detail 7C, mount a ceramic crystal socket and crystal clip on top and a #6 small solder lug under the top plate at location BX. Use a 4-40 x 1/2" round head machine screw, #4 lockwashers, and a 4-40 nut. Use care when tightening the hardware so that the crystal socket does not crack. Form the solder lug against the crystal socket lug as shown.



Detail 7C

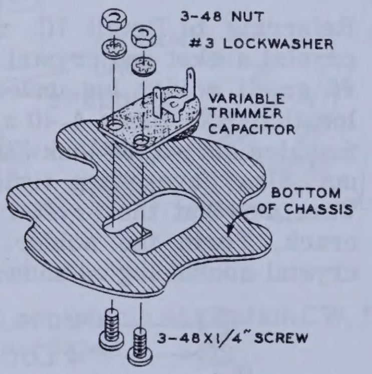
(✓) Similarly, mount a ceramic crystal socket, crystal clip, and #6 small solder lug at location CB. Use a 4-40 x 1/2" round head machine screw, #4 lockwashers, and a 4-40 nut. Do not overtighten. Form the solder lug against the crystal socket lug as shown.

(✓) Mount another ceramic crystal socket, crystal clip and a 3-lug (#2 lug ground) miniature terminal strip at location BU. Use a 4-40 x 1/2" round head machine screw, #4 lockwashers, and a 4-40 nut. Do not overtighten.

(✓) Mount ceramic crystal sockets and crystal clips A through F at location DJ. Be sure to install a #6 small solder lug on crystal socket D. Use 4-40 x 1/2" round head machine screws, #4 lockwashers, and 4-40 nuts. Do not overtighten. Form the solder lug against crystal socket lug as shown.

(✓) C9. Mount an 8 to 50 μμf ceramic trimmer capacitor at location BY. Use 3-48 x 1/4" hardware. Make sure this capacitor turns freely. See Detail 7D.

(✓) C80, C92. Mount a 1.5 to 7 μμf ceramic trimmer capacitor at locations BS and BV. Use 3-48 x 1/4" hardware.

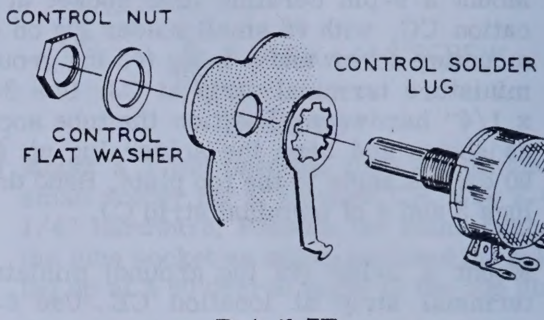


Detail 7D

(✓) C91. Mount the 3 to 12 μμf ceramic trimmer capacitor at location BT. Use 3-48 x 1/4" hardware.

(✓) R119. Locate the 10 Ω wire-wound control (#11-26) and place a control solder lug over the control bushing. Form the solder lug so that it lies against lug 3 of the control. Now cut off any excess solder lug.

(✓) Referring to Detail 7E, mount the control and control solder lug at location BG. Use a control flat washer and control nut. Position the solder lug so that it lies against lug 3 of control BG.



Detail 7E

(✓) R113. Similarly, prepare and install a 10 KΩ linear control (#10-31) and control solder lug at location BK. Use a control flat washer and control nut to secure the control. Position the solder lug against lug 1 of BK (NS).

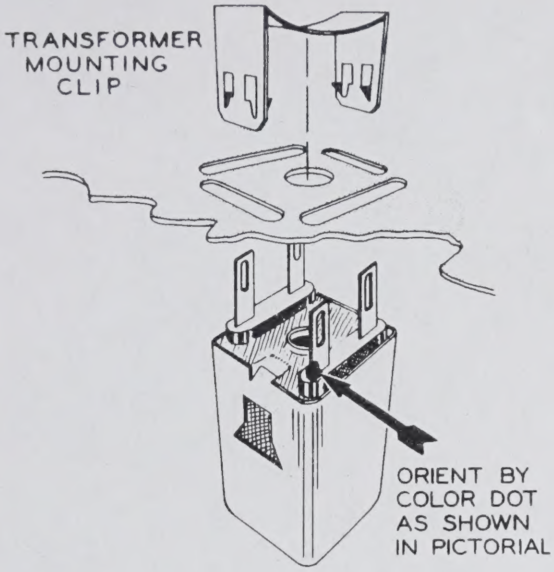
(✓) R118. Mount the 200 Ω linear control (#10-33) at location BR. Use a control lockwasher, control flat washer, and control nut. Orient the control lugs as shown.

(✓) R117. Mount the 5000 Ω linear control (#10-69) at location CK. Use a control lockwasher, control flat washer and control nut. Orient the control lugs as shown.

(✓) C45A, B, C, D. Keeping the rotor plates fully meshed to prevent damage, mount the 20-200 μμf per section ganged variable capacitor (#26-74) at location EQ. Use 6-32 x 1/4" screws and #6 lockwashers under the screw heads. Cut off the four unused lugs as shown.

(✓) Referring to Detail 7F on Pictorial 7, mount a 1/4" ID x 1/4" long brass bushing (#455-13) and base stop (#253-52) at location DK. Use a thin control lockwasher and a control nut. Orient the stop so that the threaded hole in the stop is over the hole in the top plate. Place a #6 lockwasher over a 6-32 x 1/4" round head screw, place it through the chassis and screw it into the stop. Now tighten the control nut to secure the bushing.

(✓) Referring to Detail 7G, mount IF transformers (#52-43) at locations BL and CD. Position the color dot as shown in Pictorial 7. Secure the transformers in place with the transformer mounting clips.


TRANSFORMER MOUNTING CLIP
ORIENT BY COLOR DOT AS SHOWN IN PICTORIAL

Detail 7G

( ) Mount the crystal bandpass filter (#404-90) at locations CM and CH as shown in Pictorial 7. Secure the crystal filter network with a 6-32 nut and large #6 solder lug at location CH. Place a 1/8" plastic cable clamp over the stud protruding through the top plate at location CM, and secure the clamp in place with a #6 lockwasher and 6-32 nut. Position the clamp as shown.

This completes the parts mounting on the top plate.

HARNESS WIRING ON TOP PLATE

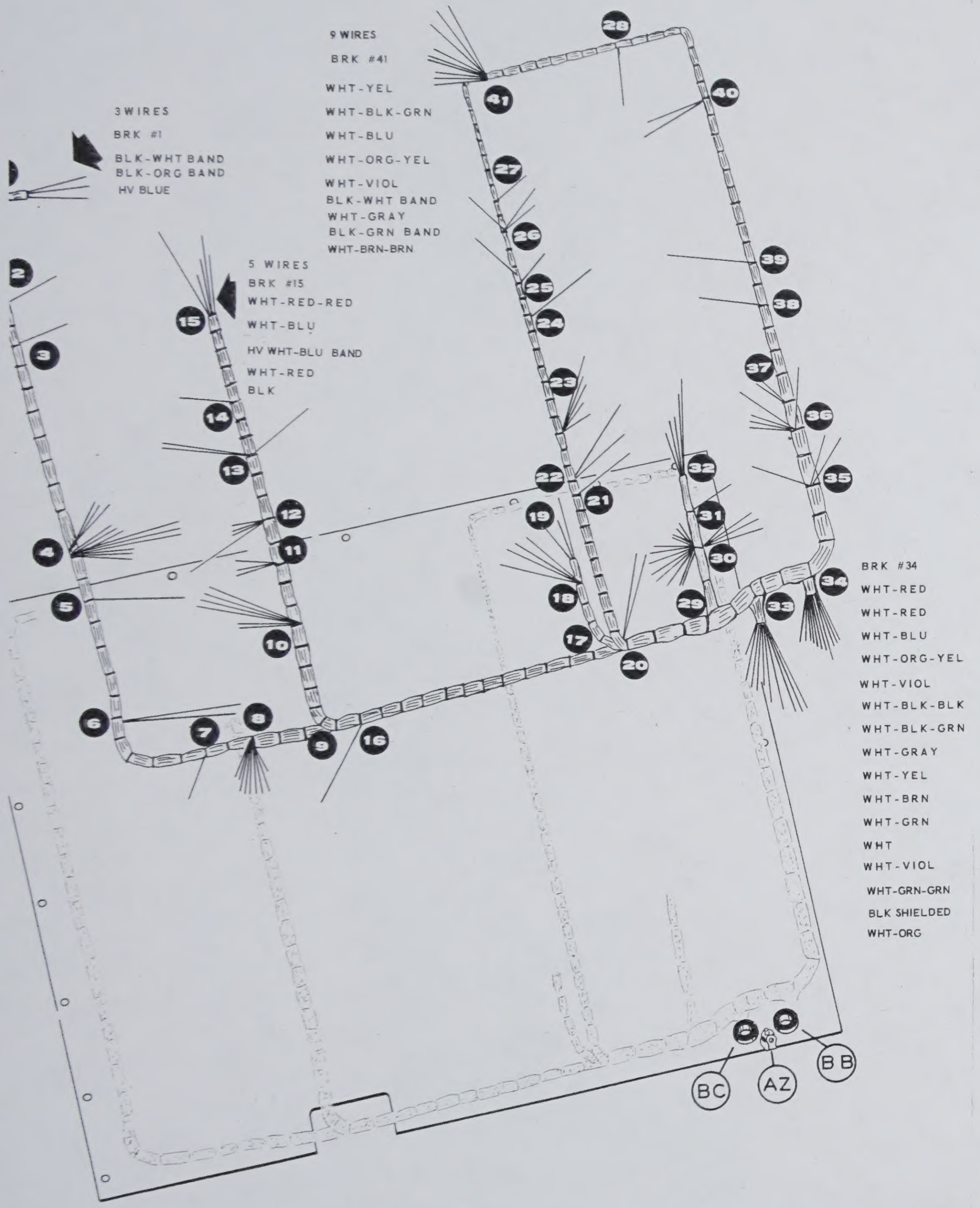
Refer to Pictorials 8 and 9A on Page 46 for the following steps.

(✓) Locate the wiring harness and separate the leads extending from each breakout point.

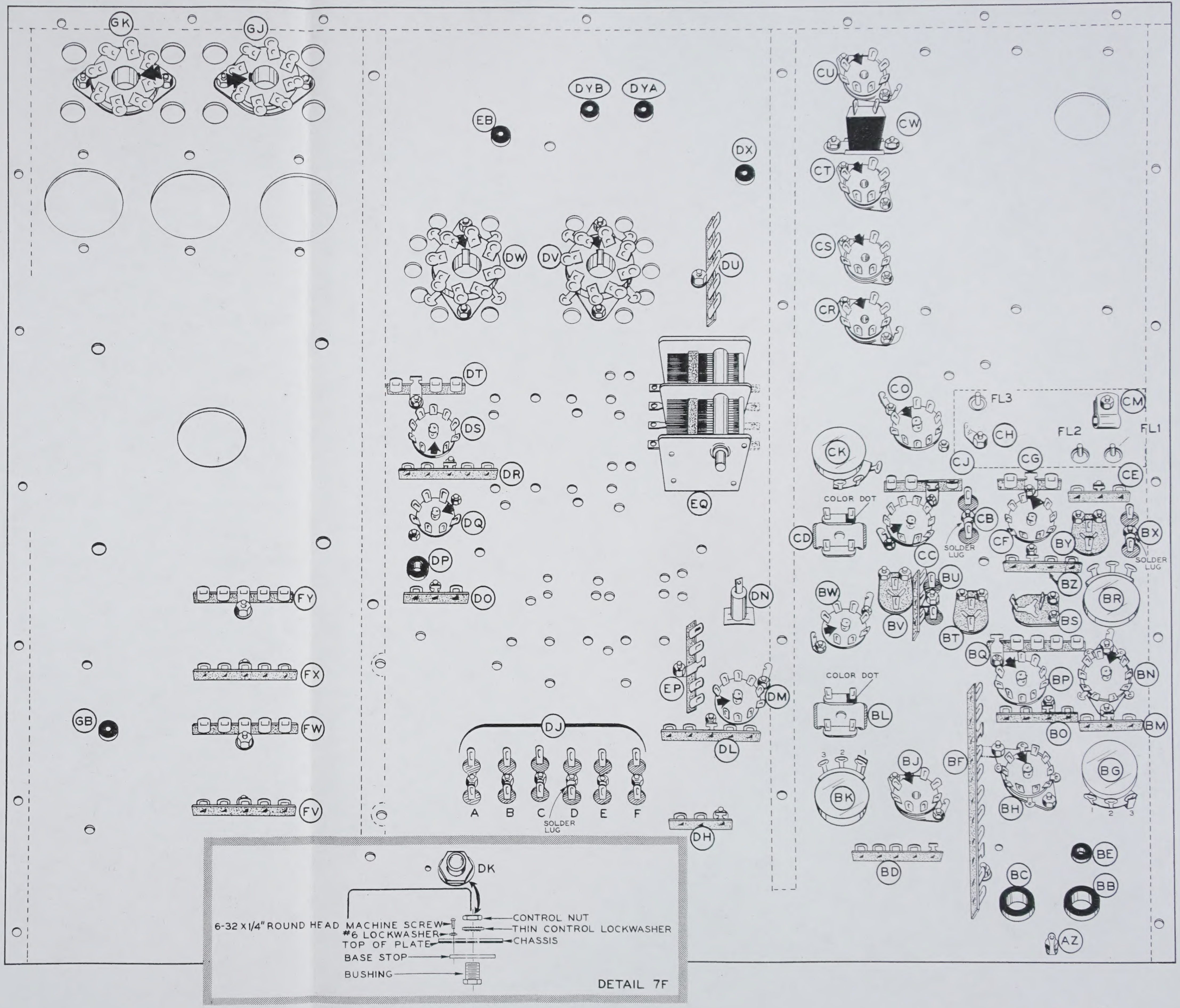
(✓) Form the harness and place it on the top plate as shown in Pictorial 8.

(✓) Separate the seventeen leads extending from Breakout #34 (BRK#34) and place all except the white-orange and black shielded cable through grommet BB.

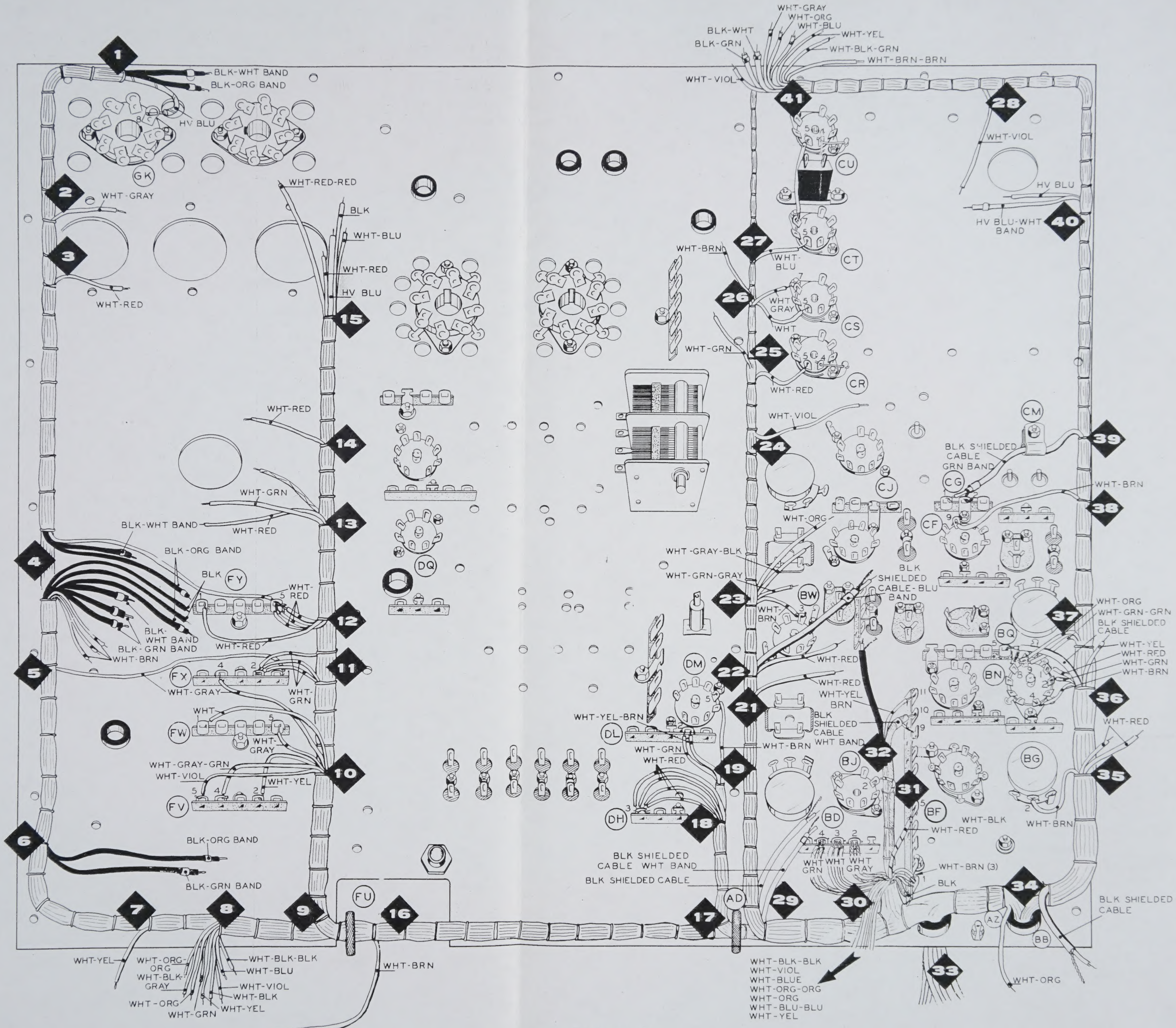
( ) Separate the ten leads and two shielded cables extending from Breakout #33 (BRK #33) and place them through grommet BC. You should now be able to place each section of the wiring harness in its respective position according to Pictorial 8.



Pictorial 8



Pictorial 7


1
BLK-WHT BAND
BLK-ORG BAND
HV BLU
GK
2
WHT-GRAY
3
WHT-RED
WHT-RED-RED
BLK
WHT-BLU
WHT-RED
HV BLU
15
WHT-RED
14
WHT-GRN
BLK-WHT BAND
WHT-RED
13
4
BLK-ORG BAND
BLK
FY
WHT-RED
5
12
BLK-WHT BAND
BLK-GRN BAND
WHT-BRN
WHT-RED
11
5
FX
4
2
WHT-GRAY
WHT-GRN
WHT
FW
5
WHT-GRAY
10
WHT-GRAY-GRN
WHT-VIOL
WHT-YEL
FV
5
4
2
6
BLK-ORG BAND
BLK-GRN BAND
7
8
9
FU
16
WHT-YEL
WHT-ORG-ORG
WHT-BLK-GRAY
WHT-ORG
WHT-GRN
WHT-BLK-BLK
WHT-BLU
WHT-VIOL
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WHT-YEL
WHT-BRN
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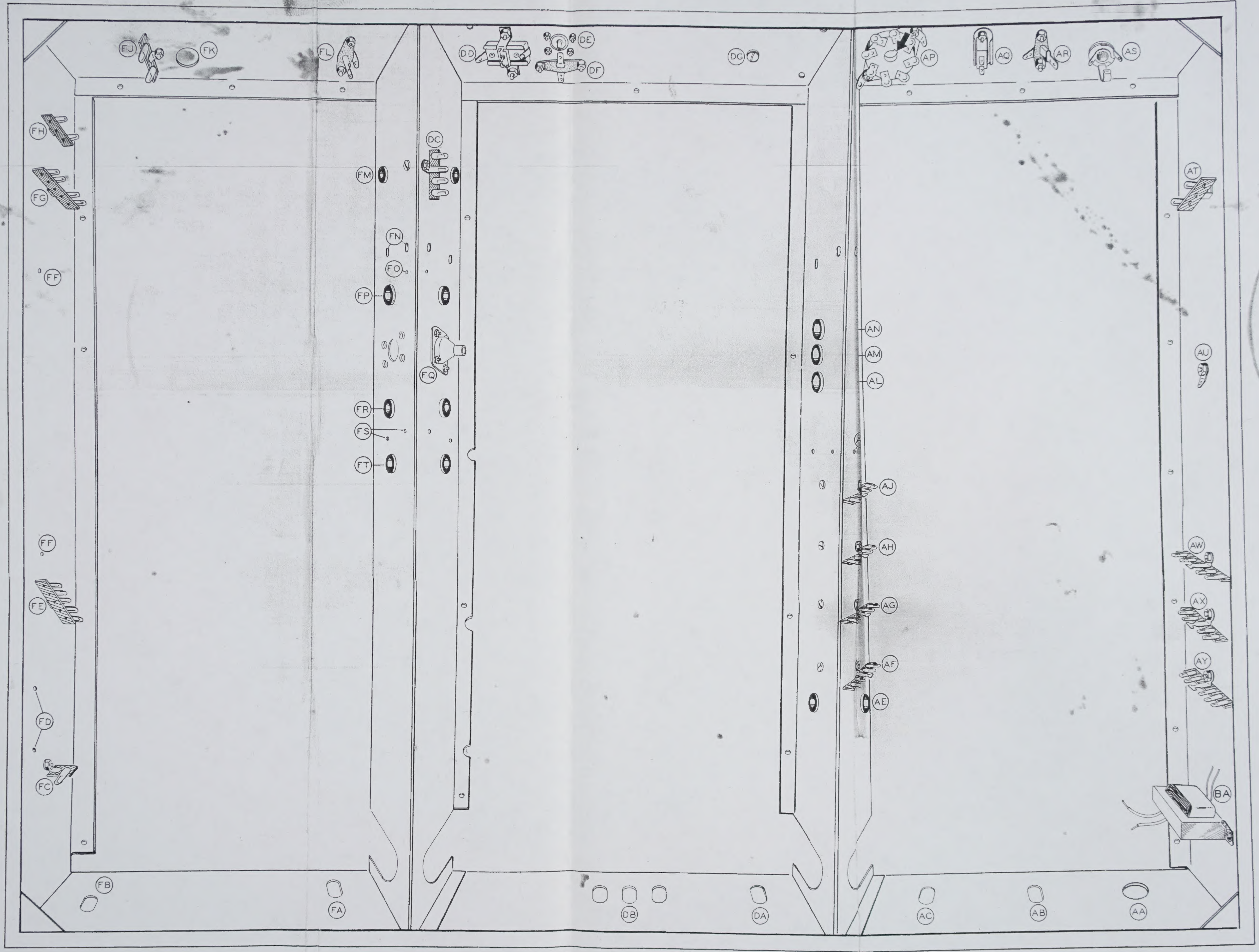
WHT-ORG
WHT-BLU
WHT-YEL
WHT-BLK-GRN
WHT-BRN-BRN
BLK-WHT
BLK-GRN
WHT-VIOL
41
28
CU
WHT-VIOL
HV BLU
HV BLU-WHT BAND
40
27
WHT-BRN
WHT-BLU
CT
26
WHT-GRAY
CS
WHT
WHT-GRN
25
WHT-RED
CR
WHT-VIOL
24
CM
39
BLK SHIELDED CABLE GRN BAND
CG
CJ
WHT-BRN
38
WHT-ORG
CF
9
WHT-GRAY-BLK
WHT-GRN-GRAY
BLK SHIELDED CABLE-BLU BAND
23
BW
WHT-BRN
3
WHT-ORG
WHT-GRN-GRN
BLK SHIELDED CABLE
37
BQ
WHT-YEL
WHT-RED
WHT-GRN
WHT-BRN
BN
DM
22
WHT-RED
WHT-RED
WHT-YEL
BRN
21
BLK SHIELDED CABLE WHT BAND
36
WHT-YEL-BRN
DL
5
11
10
9
WHT-BRN
32
WHT-GRN
WHT-RED
19
WHT-RED
BJ
BG
35
31
DH
3
18
BD
BF
5
WHT-BLK
WHT-RED
2
WHT-BRN
4
3
2
WHT GRN
WHT
WHT GRAY
WHT-BRN (3)
BLK
BLK SHIELDED CABLE WHT BAND
BLK SHIELDED CABLE
29
30
AD
17
34
AZ
BB
BLK SHIELDED CABLE
WHT-BLK-BLK
WHT-VIOL
WHT-BLUE
WHT-ORG-ORG
WHT-ORG
WHT-BLU-BLU
WHT-YEL
33
WHT-ORG

Pictorial 9


FJ
FK
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FA
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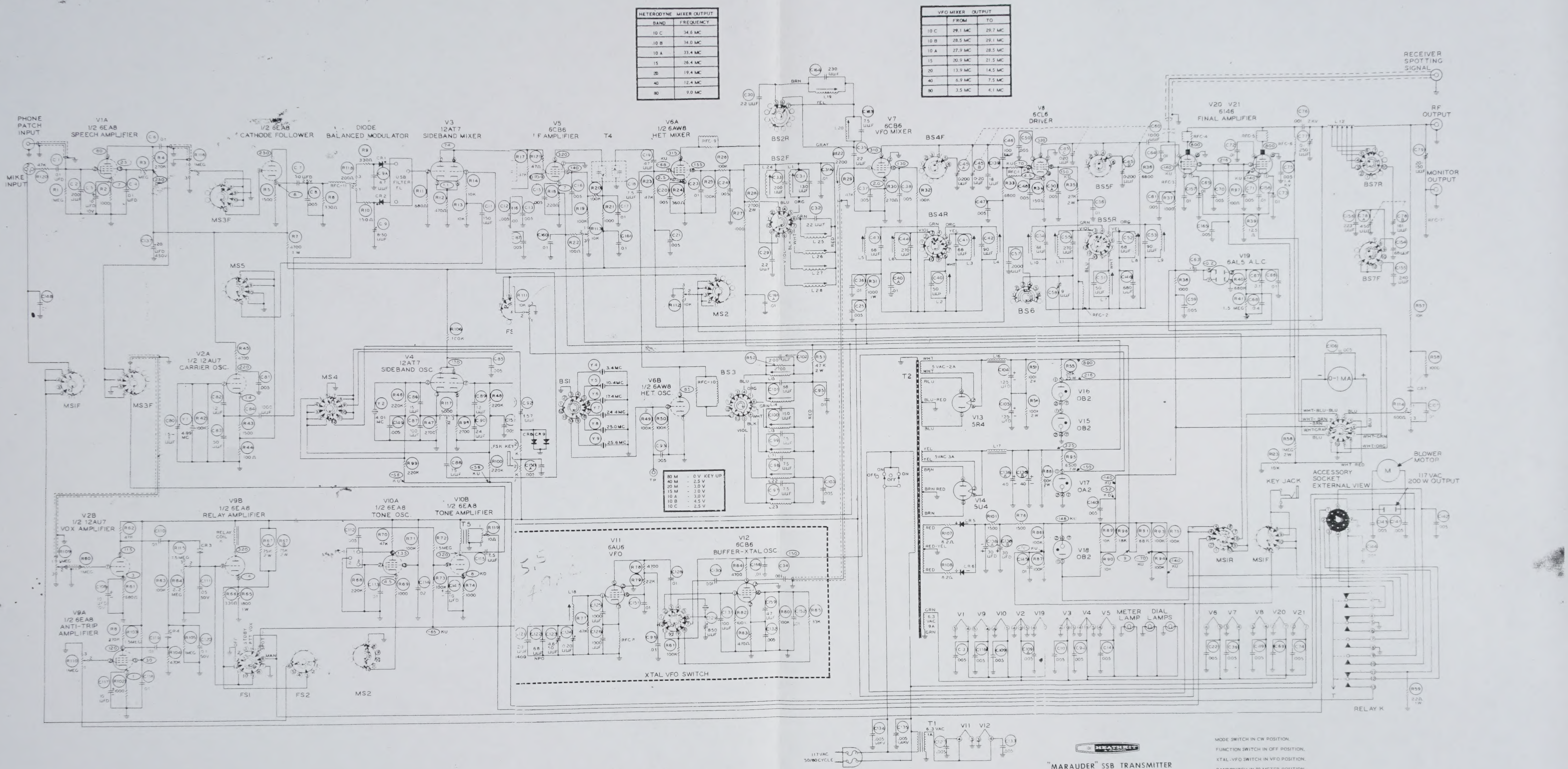
Pictorial 1



HETERODYNE MIXER OUTPUT	
BAND	FREQUENCY
10 C	34.6 MC
10 B	34.0 MC
10 A	33.4 MC
15	26.4 MC
20	19.4 MC
40	12.4 MC
80	9.0 MC

VFO MIXER OUTPUT		
	FROM	TO
10 C	29.1 MC	29.7 MC
10 B	28.5 MC	29.1 MC
10 A	27.9 MC	28.5 MC
15	20.9 MC	21.5 MC
20	13.9 MC	14.5 MC
40	6.9 MC	7.5 MC
80	3.5 MC	4.1 MC

HEATHKIT

"MARAUDER" SSB TRANSMITTER
MODEL HX-10

MODE SWITCH IN CW POSITION.

FUNCTION SWITCH IN OFF POSITION.

XTAL-VFO SWITCH IN VFO POSITION.

BANDSWITCH IN 80 METER POSITION.

METER SWITCH IN "GRID" POSITION.

ALL VOLTAGES MEASURED WITH A VTVM.

◯ INDICATES VOLTAGE READINGS.

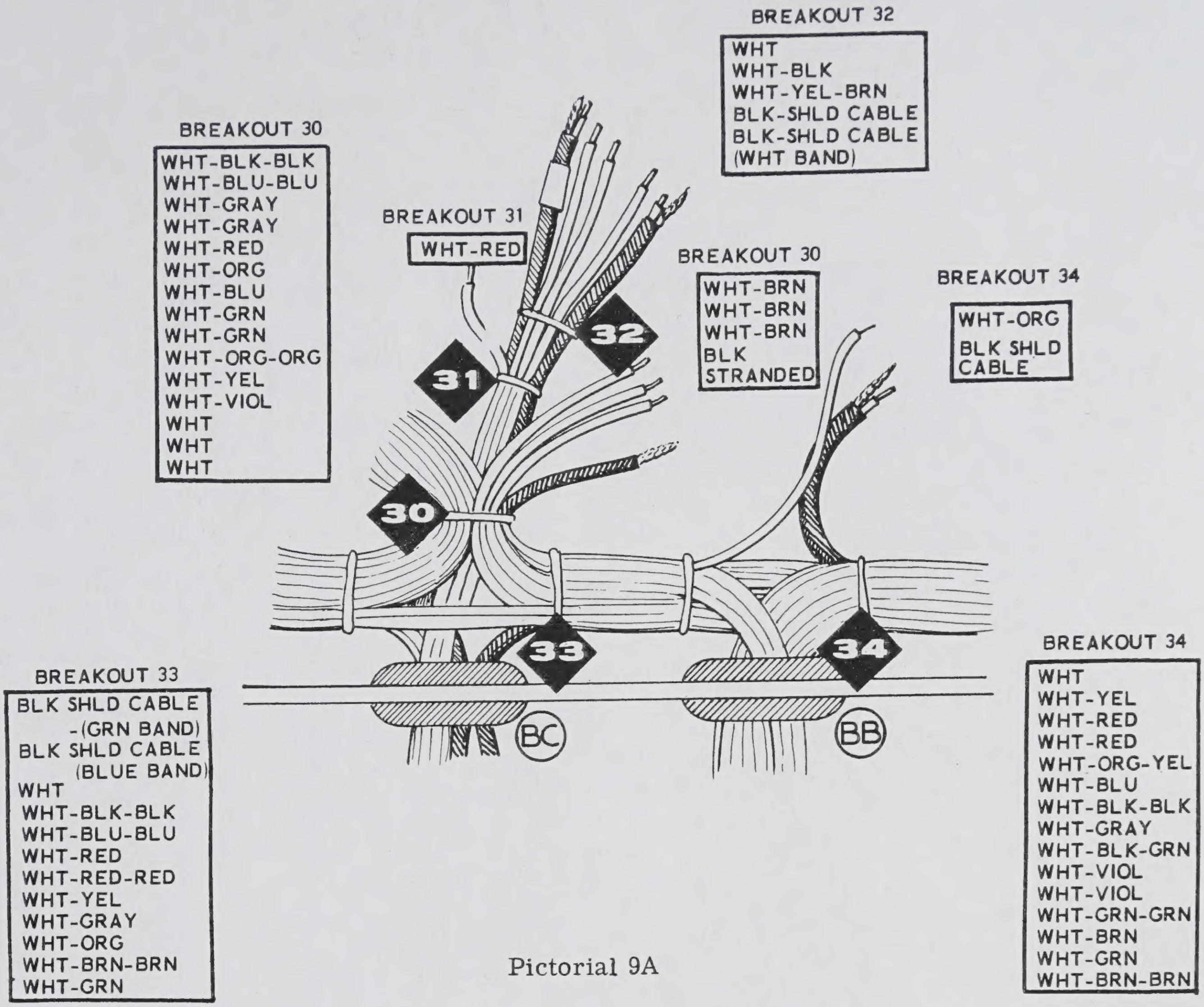
ALL VOLTAGES ARE POSITIVE UNLESS OTHERWISE SHOWN.

ALL CAPACITORS LISTED ARE IN μfd UNLESS OTHERWISE SHOWN.

ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN.

AC VOLTAGES TAKEN WITH FUNCTION SWITCH IN STBY POSITION. MODE SWITCH IN CW-KEY UP (KU) UNLESS OTHERWISE SPECIFIED (KD - KEY DOWN).

SEE MANUAL TEXT FOR RF VOLTAGES (MEASURED ONLY WITH AN RF PROBE).



Pictorial 9A

Refer to Pictorial 9 for the following steps.

NOTE: By observing the wiring harness, you will notice that each lead has specific colored stripes. These stripes will be referred to in the following steps. If a white-red lead is referred to, this would be a white lead with a red stripe. If a white-red-red lead is referred to, it will be a white lead with one wide and one narrow red stripe.

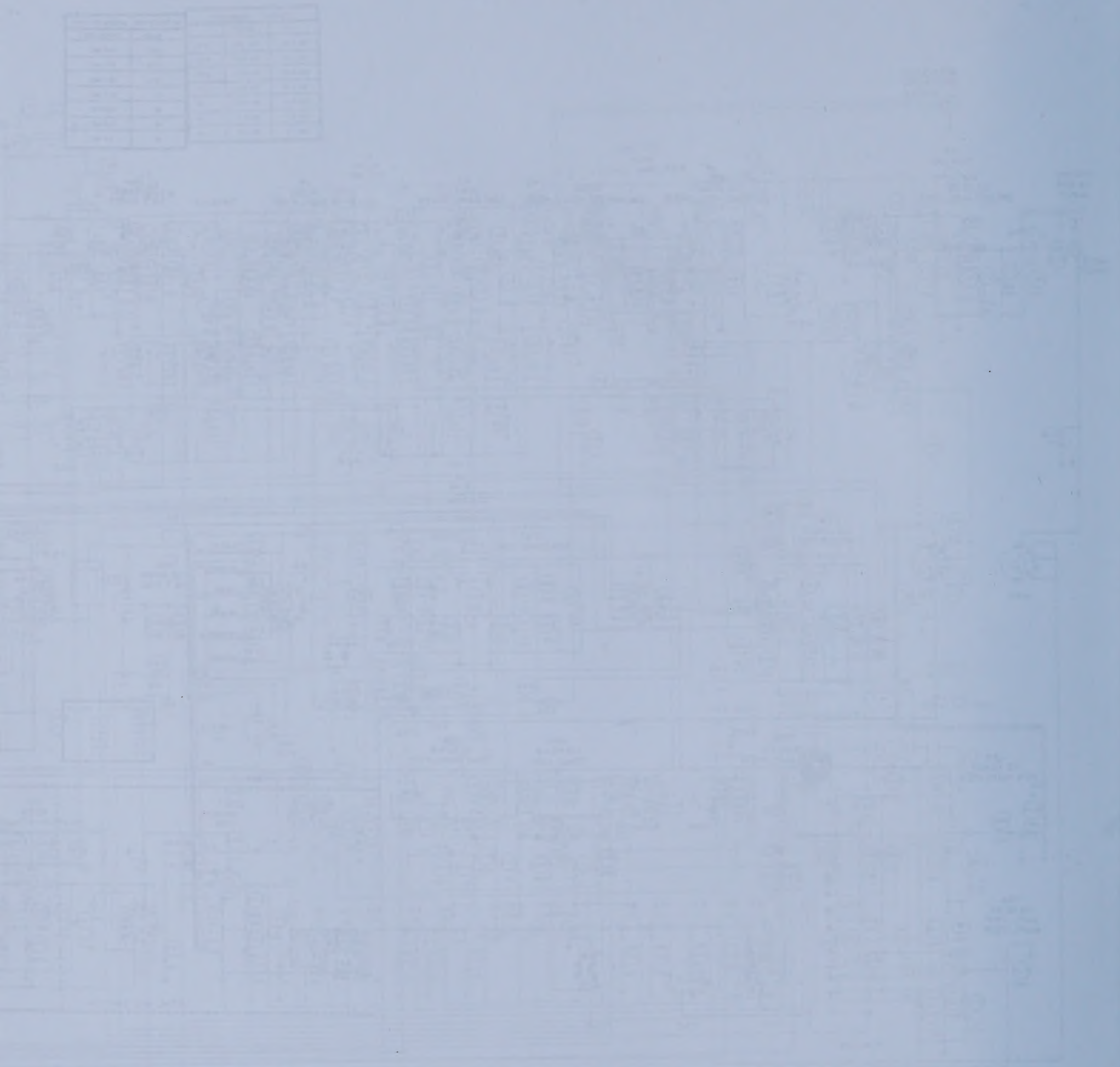
There are several heavy black leads and shielded cables. These have a color band marked on the end. As an example, they will be referred to as black with green band or black shielded cable with green band.

The wiring sequence for the harness will begin at Breakout point #1 (BRK #1) and will continue around to the final breakout point. Often the steps may skip from one breakout point to another that is further in numerical order; several breakout points have leads that are not connected at this time.

NOTE: Crimp all leads that remain unsoldered to prevent them from coming loose as the chassis is moved.

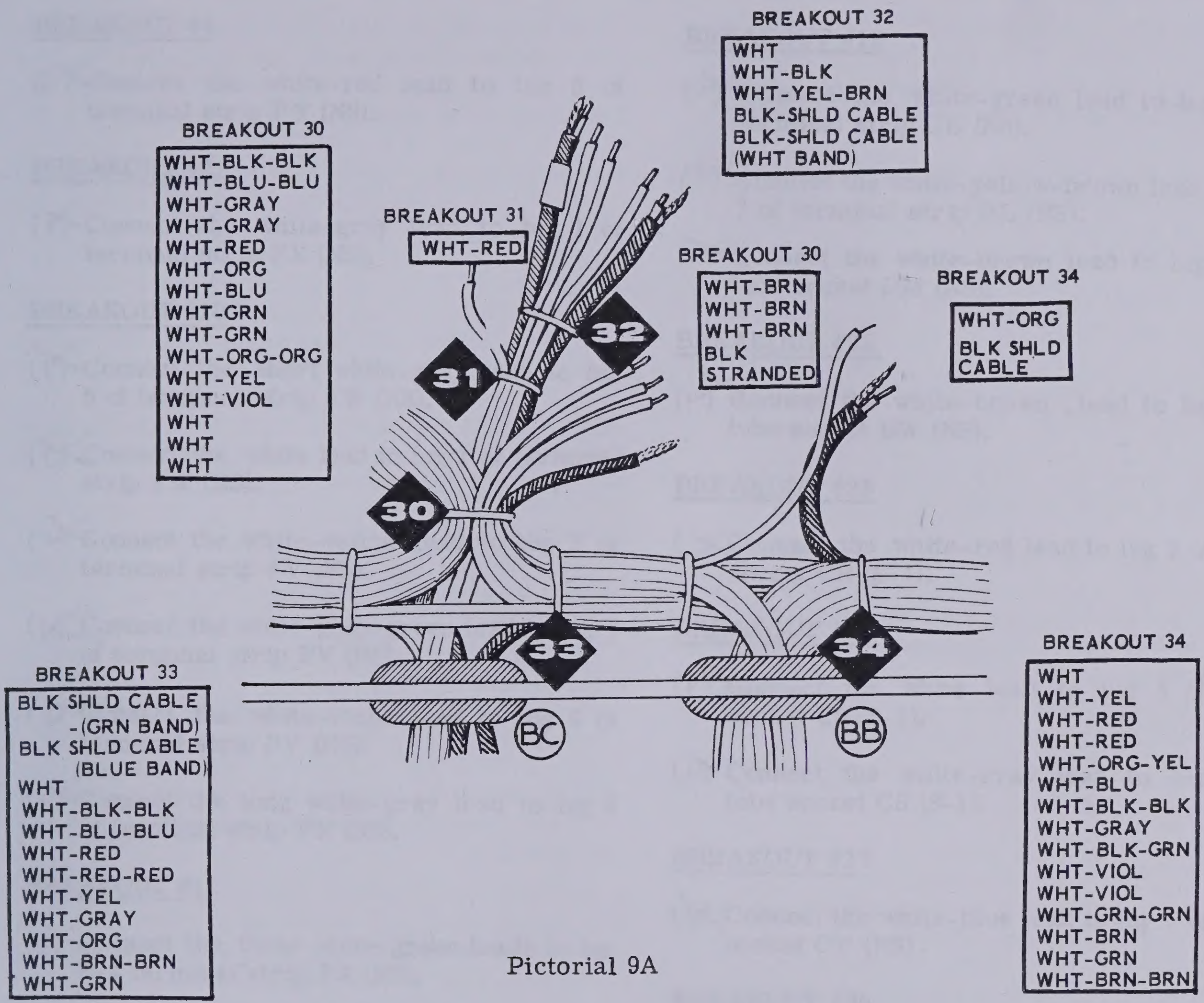
BREAKOUT #1

(✓) Connect the HV blue lead to lug 8 of tube socket GK (NS). Leave this lead full length.



[illegible]

[illegible]



Pictorial 9A

Refer to Pictorial 9 for the following steps.

NOTE: By observing the wiring harness, you will notice that each lead has specific colored stripes. These stripes will be referred to in the following steps. If a white-red lead is referred to, this would be a white lead with a red stripe. If a white-red-red lead is referred to, it will be a white lead with one wide and one narrow red stripe.

There are several heavy black leads and shielded cables. These have a color band marked on the end. As an example, they will be referred to as black with green band or black shielded cable with green band.

The wiring sequence for the harness will begin at Breakout point #1 (BRK #1) and will continue around to the final breakout point. Often the steps may skip from one breakout point to another that is further in numerical order; several breakout points have leads that are not connected at this time.

NOTE: Crimp all leads that remain unsoldered to prevent them from coming loose as the chassis is moved.

BREAKOUT #1

(✓) Connect the HV blue lead to lug 8 of tube socket GK (NS). Leave this lead full length.

BREAKOUT #4

☑ Connect the white-red lead to lug 5 of terminal strip FY (NS).

BREAKOUT #5.

☑ Connect the white-gray lead to lug 1 of terminal strip FX (NS).

BREAKOUT #10

☑ Connect the short white-gray lead to lug 5 of terminal strip FW (NS).

☑ Connect the white lead to lug 1 of terminal strip FW (NS).

☑ Connect the white-yellow lead to lug 2 of terminal strip FV (NS).

☑ Connect the white-gray-green lead to lug 4 of terminal strip FV (NS).

☑ Connect the white-violet lead to lug 5 of terminal strip FV (NS).

☑ Connect the long white-gray lead to lug 4 of terminal strip FX (NS).

BREAKOUT #11

☑ Connect the three white-green leads to lug 2 of terminal strip FX (NS).

BREAKOUT #12

☑ Connect the three short white-red leads to lug 5 of terminal strip FY (NS).

☑ Connect the long white-red lead to lug 1 of terminal strip FY (NS).

BREAKOUT #16

☑ Place the white-brown lead through the rectangular cutout in the chassis. It will be connected later.

BREAKOUT #18

☑ Connect the four white-red leads to lug 3 of terminal strip DH (NS).

BREAKOUT #19

☑ Connect the white-green lead to lug 2 of terminal strip DL (NS).

☑ Connect the white-yellow-brown lead to lug 2 of terminal strip DL (NS).

☑ Connect the white-brown lead to lug 5 of tube socket DM (NS).

BREAKOUT #23

☑ Connect the white-brown lead to lug 3 of tube socket BW (NS).

BREAKOUT #25

☑ Connect the white-red lead to lug 5 of tube socket CR (S-1).

BREAKOUT #26

☑ Connect the white lead to lug 5 of tube socket CS (S-1).

☑ Connect the white-gray lead to lug 7 of tube socket CS (S-1).

BREAKOUT #27

☑ Connect the white-blue lead to lug 5 of tube socket CT (NS).

BREAKOUT #39

☑ Place the black shielded cable with the green band through cable clamp CM. Connect the inner conductor of this cable to lug 1 of terminal strip CG (NS). Connect the shield to lug 2 of CG (NS). It may be necessary to loosen the cable clamp to fit the shielded cable through it. If so, be sure to retighten the clamp.

CAUTION! When soldering shielded cable leads, beware of melting the inner insulation. Checking each lead for a short circuit as you proceed will save time in the long run.

BREAKOUT #38

☑ Connect the white-brown lead to lug 9 of tube socket CF (NS).

BREAKOUT #37

(✓) Connect the white-green-green lead to lug 9 of tube socket BN (NS).

(✓) Connect the white-orange lead to lug 9 of tube socket BN (NS).

BREAKOUT #36

(✓) Connect the white-red lead to lug 1 of tube socket BN (S-1).

(✓) Connect the white-green lead to lug 2 of tube socket BN (S-1).

(✓) Connect the white-brown lead to lug 4 of tube socket BN (NS).

(✓) Connect the inner conductor of the black shielded cable to lug 5 of terminal strip BQ (NS). Connect the shield of this cable to the ground lug nearest lug 8 of tube socket BN (S-1).

BREAKOUT #35

(✓) Connect the white-brown lead to lug 2 of control BG (S-1).

BREAKOUT #30

(✓) Connect the two white-green leads to lug 4 of terminal strip BD (NS).

(✓) Connect the three white leads to lug 3 of terminal strip BD (NS).

(✓) Connect the two white-gray leads to lug 2 of terminal strip BD (NS).

(✓) Connect the white-red lead to lug 5 of terminal strip BF (NS).

(✓) Connect the heavy black lead to the eyelet of lug 1 of terminal strip BF (S-1).

(✓) Connect the three white-brown leads to lug 1 of terminal strip BF (NS).

BREAKOUT #31

(✓) Connect the white-red lead to lug 2 of tube socket BJ (S-1).

BREAKOUT #32

(✓) Connect the white-yellow-brown lead to lug 11 of terminal strip BF (NS).

(✓) Connect the inner conductor of the black shielded cable with the white band to lug 10 of terminal strip BF (NS). Connect the shield of this cable to lug 9 of BF (NS).

This completes the harness wiring on the top plate. The remaining leads will be connected after assembly to the chassis base.

(✓) Connect a 3" red hookup wire from lug 7 of tube socket CT (S-1) to lug 5 of tube socket CU (S-1).

(✓) Connect a length of #20 bare wire from lug 4 of tube socket CR (S-1) to the solder lug nearest lug 4 of CR (S-1).

(✓) Connect a length of #20 bare wire from lug 4 of tube socket CU (S-1) to the solder lug nearest lug 4 of CU (S-1).

TOP PLATE WIRING

Refer to Pictorial 10 (fold-out from Page 55) for the following steps.

NOTE: Place all components, around tube sockets and terminal strips as close to the top plate as possible.

(✓) C109. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (S-1) of terminal strip BF.

(✓) C147. Cut both leads of a 10 μfd 10 V electrolytic capacitor to 3/4". Connect the positive (+) lead to lug 7 of terminal strip BF (NS). Use sleeving. Connect the other lead of this capacitor to lug 9 of BF (NS).

(✓) R72. Cut both leads of a 1.5 megohm (brown-green-green) 1/2 watt resistor to 3/4". Connect this resistor between lugs 4 (NS) and 8 (NS) of terminal strip BF. Use sleeving on both leads.

(✓) R74. Cut one lead of a 1000 Ω (brown-black-red) 1/2 watt resistor to 3/4" and the other lead to 3/8". Place the long lead through lug 7 of terminal strip BF (NS) to lug 8 of tube socket BH (S-1). Connect the other lead of this resistor to lug 9 of terminal strip BF (S-3). Now solder lug 7 of BF (S-3).

(✓) R73. Cut one lead of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1" and the other lead to 3/8". Place the long lead through lug 8 of terminal strip BF (NS) to lug 9 of tube socket BH (S-1). Now solder lug 8 of BF (S-3). Connect the other lead of this resistor to lug 11 of BF (S-2).

(✓) C113. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 7 of tube socket BH (NS) to the ground lug nearest lug 6 of BH (S-1).

(✓) C112. Cut both leads of a .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 6 of tube socket BH (NS) to lug 4 of terminal strip BF (S-2).

(✓) Connect a 2" brown hookup wire from lug 2 of terminal strip BF (NS) to lug 3 of tube socket BJ (S-1).

(✓) Strip 1/2" of insulation from one end of a 3" brown hookup wire. Place this end through lug 2 (NS) to lug 1 (S-4) of terminal strip BF. Now solder lug 2 of BF (S-4). Connect the other end of this hookup wire to lug 5 of tube socket BH (NS).

(✓) Connect a 3-1/2" brown hookup wire from lug 5 of tube socket BH (S-2) to lug 4 of tube socket BP (NS).

(✓) C3. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 4 of tube socket BP (S-2) to the eyelet of lug 2 of terminal strip BO (S-1).

(✓) Place a short length of bare wire from the center post (NS) through lug 4 (NS) of tube socket BH, to the ground lug nearest lug 3 of BH (S-1). Now solder lug 4 of BH (S-2).

(✓) R68. Cut both leads of a 220 KΩ (red-red-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 2 of tube socket BH (NS) to lug 2 of terminal strip BO (NS).

(✓) Connect one end of a 4" blue hookup wire to lug 3 of tube socket BH (S-1). Dress under the harness and under the control. Leave the other end free.

(✓) R120. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor between lugs 5 (S-2) and 4 (NS) of terminal strip BQ.

(✓) Connect a length of bare wire from the center post (NS) through lug 5 (NS) of tube socket BP, to lug 2 of terminal strip BO (S-2). Now solder the center post (S-1) of BP. Use care in soldering lugs to prevent damage to the coaxial cable.

(✓) C115. Connect one lead of a 7.5 μμf resin dipped mica capacitor through lug 3 of terminal strip BO (NS) to lug 1 of tube socket BH (NS). Connect the other lead of this capacitor to lug 4 of terminal strip BO (NS). Now solder lug 3 of BO (S-2).

(✓) Connect one end of a 5" white hookup wire to lug 1 of terminal strip BO (NS). Dress under the control and under the harness. Leave the other end free.

(✓) Connect one end of a 2" white hookup wire to lug 1 of terminal strip BO (NS). Dress as shown. Connect the other end of this wire to lug 1 of tube socket BP (S-1).

(✓) C5. Cut both leads of a 10 μfd 10 volt electrolytic capacitor to 3/8". Connect the positive (+) lead of this capacitor to lug 7 of tube socket BP (NS). Connect the other lead of this capacitor to the eyelet in lug 9 of terminal strip BF (NS).

(✓) R2. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 1/2". Connect this resistor from lug 7 of tube socket BP (S-2) to the eyelet in lug 9 of terminal strip BF (S-2).

(✓) R5. Cut both leads of a 1500 Ω (brown-green-red) 1/2 watt resistor to 3/8". Connect this resistor from lug 8 of tube socket BP (NS) to lug 1 of terminal strip BQ (NS). Use the eyelet in the bottom of this lug.

(✓) R6. Cut both leads of a 330 Ω (orange-orange-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of terminal strip BQ (NS) to lug 4 of terminal strip BZ (NS). Position to avoid the dotted area.

(✓) C8. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of terminal strip BZ.

(✓) R1. Cut both leads of a 1 megohm (brown-black-green) 1/2 watt resistor to 1/2". Connect this resistor from the eyelet of lug 1 of terminal strip BQ (S-2) to lug 2 of tube socket BP (NS).

(✓) C1. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 2 of tube socket BP (NS) to lug 4 of terminal strip BQ (S-2).

(✓) Connect one end of a 6" blue hookup wire to lug 2 of terminal strip BQ (NS). Dress under the harness and leave the other end free.

(✓) C2. Cut both leads of a 200 $\mu\mu$f resin dipped capacitor to 1/2". Connect this capacitor from lug 1 of terminal strip BQ (NS) to lug 2 of tube socket BP (NS).

(✓) Connect one end of a 4" yellow hookup wire to lug 6 of tube socket CF (NS). Dress under the harness and leave the other end free.

(✓) R65. Cut both leads of an 1800 Ω (brown-gray-red) 1 watt resistor to 1/2". Connect this resistor from lug 8 of tube socket BN (NS) to the solder lug nearest lug 9 of tube socket BN (S-1).

(✓) Connect a length of bare wire through the center post of tube socket BN (NS) through lug 5 of BN (NS) to the eyelet on lug 2 of terminal strip BM (S-1). Use care in soldering so as not to burn the blue lead.

(✓) R102. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 3/8". Connect one lead to lug 5 of tube socket BN (S-3). Connect the other lead of this resistor to lug 7 of BN (NS).

(✓) C117. Cut both leads of a 10 μfd 10 V electrolytic capacitor to 1/2". Connect the positive (+) lead of this capacitor to lug 7 of tube socket BN (S-2). Connect the other lead of this capacitor to lug 2 of terminal strip BM (S-1).

(✓) Connect one end of a 4" yellow hookup wire to lug 3 of terminal strip BM (NS). Dress under the harness. Leave the other end free.

(✓) C116. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 4 of tube socket BN (S-2) to the ground lug nearest lug 3 of BN (S-1).

(✓) Connect one end of a 3-1/2" red hookup wire to lug 1 of terminal strip BM (NS). Dress under the harness. Leave the other end free.

(✓) R103. Cut both leads of a 1.5 megohm (brown-green-green) 1/2 watt resistor to 3/8". Connect this resistor from lug 3 of tube socket BN (NS) to lug 1 of terminal strip BM (NS).

(✓) Connect a length of bare wire from the center post (NS) through lug 4 (NS) of tube socket CF, lug 3 of terminal strip BZ (NS) to lug 1 of ceramic trimmer BS (S-1). Now solder lug 4 of CF (S-2).

(✓) Connect a short length of bare wire from lug 5 (S-1) to the center post (S-2) of tube socket CF.

(✓) C109A. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 9 of tube socket CF (S-2) to the eyelet in lug 2 of terminal strip CG (NS).

(✓) C81. Cut both leads of a .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 1 of tube socket CF (NS) to the eyelet in lug 2 of terminal strip CG (NS).

(✓) R60. Cut both leads of a 1 megohm (brown-black-green) 1/2 watt resistor to 1/2". Connect this resistor from lug 7 of tube socket CF (S-1) to lug 1 of terminal strip CG (S-2). Position clear of the dotted area.

(✓) Connect a 2-1/4" length of green hookup wire from lug 2 of trimmer capacitor BS (NS) to lug 2 of tube socket CF (NS).

(✓) C82. Cut both leads of a 12 $\mu\mu$f mica molded (brown-red-black) capacitor to 3/8". Connect this capacitor from lug 2 of trimmer capacitor BS (S-2) to lug 1 of terminal strip BZ (NS).

(✓) R43. Cut one lead of a 1500 Ω (brown-green-red) 1/2 watt resistor to 1-1/4" and the other lead to 3/8". Place the long lead through lug 1 of terminal strip BZ (NS) to lug 3 of tube socket CF (NS). Connect the other lead of this resistor to lug 2 of terminal strip BZ (NS).

(✓) C83. Cut both leads of a 50 $\mu\mu$f resin dipped capacitor to 3/8". Connect this capacitor between lugs 1 (S-4) and 3 (NS) of terminal strip BZ.

(✓) R42. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of tube socket CF (NS) to the eyelet in lug 2 of terminal strip CE (S-1). Use sleeving on the lead to CF2.

(✓) Connect a length of bare wire from lug 2 of tube socket CF (S-3) to lug 2 of crystal socket BX (S-1). Use sleeving on this lead.

(✓) C9A. Cut both leads of a 4.7 μμf tubular capacitor to 1/2". Connect this capacitor between lugs 1 (NS) and 2 (S-1) of terminal strip CE.

( ) Connect a length of bare wire from lug 1 of trimmer capacitor BY (S-1) to lug 1 of crystal socket BX (NS). Use sleeving.

( ) Solder the #6 small solder lug mounted on crystal socket BX to lug 1 of BX (S-2).

Refer to Pictorial 11 (fold-out from Page 55) for the following steps.

(✓) Solder the control solder lug mounted on control BG to lug 3 of BG (S-1).

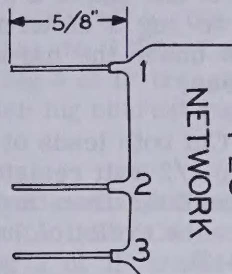
(✓) R70. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 5 of terminal strip BF (S-2) to lug 6 of tube socket BH (NS).

(✓) R69. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 3/8". Connect this resistor from lug 7 of tube socket BH (S-2) to lug 6 of terminal strip BF (NS).

(✓) Referring to Detail 11A, which is full size, cut leads 1, 2, and 3 from the P.E.C. (Packaged Electronic Circuit, #84-22) to the length shown.

(✓) Connect lead 1 of the P.E.C. to lug 6 of tube socket BH (S-3).

(✓) Connect lead 2 of the P.E.C. to the center post of tube socket BH (S-2).



Detail 11A

(✓) Connect lead 3 of the P.E.C. to lug 2 of tube socket BH (S-2).

(✓) R4. Cut both leads of a 270 KΩ (red-violet-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 6 of tube socket BP (NS) to lug 1 of terminal strip BO (NS).

(✓) C6. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 6 of tube socket BP (S-2) to lug 10 of terminal strip BF (NS).

(✓) R3. Cut both leads of a 1.5 megohm (brown-green-green) 1/2 watt resistor to 3/8". Connect this resistor from lug 3 of tube socket BP (NS) to lug 1 of terminal strip BO (S-4).

(✓) C4. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 3 of tube socket BP (S-2) to lug 5 of tube socket BP (S-3).

(✓) C118. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 3 of tube socket BN (S-2) to the center post of tube socket BN (S-2).

(✓) C119. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 6 of tube socket BN (NS) to lug 3 of terminal strip BM (S-2).

(✓) R8. Cut both leads of a 270 KΩ (red-violet-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 6 of tube socket BN (S-2) to lug 1 of terminal strip BM (S-3).

(✓) R62. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/4". Connect this resistor from lug 2 of terminal strip BQ (S-2) to lug 6 of tube socket CF (S-2). Use sleeving on the lead to CF. Avoid the dotted area when positioning this component.

(✓) Connect one end of a 6" length of red hookup wire to lug 3 of terminal strip CG (NS). Dress under the harness. Leave the other end free.

(✓) R61. Cut both leads of a 680 Ω (blue-gray-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 8 of tube socket CF (NS) to the eyelet of lug 2 of terminal strip CG (S-3).

(✓) C108. Cut both leads of a 10 μfd 10 V electrolytic capacitor to 3/8". Connect the positive (+) lead of this capacitor from lug 8 of tube socket CF (S-2). Connect the other lead to lug 2 of terminal strip CG (S-2).

(✓) R44. Cut both leads of a 100 Ω (brown-black-brown) 1/2 watt resistor to 1/2". Connect this resistor between lugs 3 (S-5) and 2 (NS) of terminal strip BZ.

(✓) R45. Cut both leads of a 4700 Ω (yellow-violet-red) 1/2 watt resistor to 3/8". Connect this resistor from lug 1 of tube socket CF (S-2) to lug 3 of terminal strip CG (S-2).

(✓) Connect a length of bare wire from lug 2 of trimmer capacitor BY (S-1) to lug 3 of terminal strip CE (NS).

(✓) R9. Cut both leads of a 330 Ω (orange-orange-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 3 of control BR (S-1) to lug 1 of terminal strip CE (NS).

(✓) R10. Cut both leads of a 150 Ω (brown-green-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of control BR (S-1) to lug 3 of terminal strip CE (NS).

(✓) C84. Cut both leads of a 1000 μμf resin dipped mica capacitor to 3/4". Connect this capacitor from lug 3 of tube socket CF (S-2) to lug 2 of control BR (NS).

(✓) CR1, CR2. Locate the encapsulated diode case (#56-9) and note there are red dots on both sides of the case, indicating polarity. Positioning the case as shown, connect the lead from one red dot to lug 3 of miniature terminal strip CE (S-3). Connect the remaining lead from the same end to lug 1 of CE (S-3). Connect the lead from the other red dot to FL1 (S-1). Connect the remaining lead to FL2 (S-1).

Refer to Pictorial 12 (fold-out from Page 55) for the following steps.

(✓) R38. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 3/8". Connect this resistor between lugs 2 (NS) and 4 (NS) of terminal strip BD.

(✓) C59. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (S-4) and 1 (S-1) of terminal strip BD.

(✓) C63. Cut both leads of a .1 μfd 50 V disc ceramic capacitor to 3/8". Connect this capacitor between lugs 4 (S-4) and 5 (NS) of terminal strip BD.

(✓) Place a length of bare wire through lugs 1 (NS) and 4 (NS) of tube socket BJ, to the solder lug nearest lug 3 (S-1) of BJ. Now solder lugs 1 (S-1) and 4 (S-2) of BJ.

(✓) Place a length of bare wire through lug 5 of terminal strip BD (NS) through lug 5 (NS) to lug 7 (S-1) of tube socket BJ. Now solder lug 5 of BJ (S-2) and lug 5 of BD (S-2).

(✓) C17. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 2 of IF transformer BL (NS) to the solder lug nearest lug 7 of tube socket BW (S-1).

(✓) C16. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 6 (NS) and 7 (NS) of tube socket BW.

(✓) Bend lug 4 of IF transformer BL over until it touches the chassis and solder (S-1). Use enough heat to provide a good connection to the top plate.

(✓) Connect one end of a 2" green hookup wire to lug 3 of IF transformer BL (S-1). Leave the other end free.

(✓) R20. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of IF transformer BL (NS) to lug 6 of tube socket BW (NS).

(✓) Connect a length of bare wire from lug 1 of IF transformer BL (S-1) to lug 5 of tube socket BW (S-1). Use sleeving.

(✓) Place a length of bare wire through lug 4 (NS), through the center post (NS), to lug 7 (S-2) of tube socket BW. Connect the other end to the solder lug nearest lug 4 of BW (NS). Now solder the center post (S-2).

(✓) CR8, CR9. Connect two #56-4 crystal diodes in parallel by wrapping the leads of one around the matching leads of the other. (Red bands of both at the same end). Solder with care.

(✓) Connect the red band end of this combination to lug 4 of tube socket BW (S-3). Connect the other lead to lug 1 of trimmer capacitor BV (NS).

(✓) Connect a 2-1/2" length of green hookup wire to lug 2 of trimmer capacitor BV (S-1). Leave the other end free.

(✓) Connect a 2" brown hookup wire from lug 3 of tube socket BW (NS) to lug 9 of tube socket CC (NS).

(✓) Connect a 3" length of brown hookup wire from lug 9 of tube socket CC (NS) to lug 9 of tube socket CO (NS).

(✓) C14. Cut both leads of a .005 µfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 3 of tube socket BW (S-3) to the solder lug nearest lug 4 of BW (NS).

(✓) C15. Cut both leads of another .005 µfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 2 of tube socket BW (NS) to the solder lug nearest lug 4 of BW (NS).

(✓) R17. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor between lugs 3 (NS) and 4 (NS) of IF transformer CD.

(✓) C13. Cut both leads of a .005 µfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 4 of IF transformer CD (NS) to the solder lug nearest lug 9 of tube socket CC (NS).

(✓) C12. Cut both leads of a .005 µfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 2 of IF transformer CD (NS) to the solder lug nearest lug 9 of tube socket CC (NS).

(✓) C94. Cut both leads of another .005 µfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 9 of tube socket CC (S-3) to the solder lug nearest lug 9 of CC (NS).

(✓) C89. Cut both leads of a 12 µµf mica molded capacitor (brown-red-black) to 1/2". Connect this capacitor between lugs 7 (NS) and 8 (NS) of tube socket CC.

(✓) C90. Cut both leads of a 24 µµf resin dipped mica capacitor to 1/2". Connect this capacitor from lug 8 of tube socket CC (NS) to lug 1 of crystal socket CB (S-2). This includes the solder lug attached to the mounting screw of this crystal socket.

(✓) Place a length of bare wire through lug 7 of tube socket CC (NS) to lug 2 of crystal socket BU (NS). Use sleeving.

(✓) Connect a 1-1/2" length of green hookup wire to lug 2 of trimmer capacitor BT (S-1). Leave the other end free.

(✓) C85. Cut both leads of a .005 µfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 5 (NS) and 6 (NS) of tube socket CC.

(✓) Connect a 1-1/2" green hookup wire from lug 2 of tube socket CC (NS) to lug 2 of crystal socket CB (S-1).

(✓) C86. Cut both leads of a 15 µµf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of tube socket CC.

(✓) C87. Cut both leads of a 100 µµf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of tube socket CC.

(X) Place a length of bare wire through lugs 4 (NS), 5 (NS), the center post (NS) of tube socket CC and connect it to the solder lug nearest lug 9 of tube socket CC (S-4). Now solder the center post (S-2), lug 4 (S-3) and lug 5 (S-2) of CC.

(X) C149. Connect a .005 μfd disc ceramic capacitor between lugs 1 (NS) and 3 (NS) of terminal strip CJ.

(X) C11. Cut both leads of a 150 μμf resin dipped mica capacitor to 1/2". Connect this capacitor between lugs 2 (NS) and 4 (S-1) of terminal strip CJ. Allow the lead at lug 4 to project vertically from the terminal lug.

(X) R13. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 3/8". Connect this resistor between lugs 2 (NS) and 3 (S-2) of terminal strip CJ.

(X) C88. Cut both leads of a 7.5 μμf resin dipped mica capacitor to 1/2". Connect this capacitor from lug 7 of tube socket CO (NS) to lug 2 of control CK (S-1).

(X) R14. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 7 of tube socket CO (S-2) to lug 2 of terminal strip CJ (S-3).

(X) R47. Cut both leads of a 2700 Ω (red-violet-red) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of control CK (NS) to the solder lug nearest lug 9 of tube socket CO (NS).

(X) C10. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 9 of tube socket CO (S-2) to the solder lug nearest lug 9 of CO (NS).

(X) R11. Cut both leads of a 680 Ω (blue-gray-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of tube socket CO (NS) to the solder lug nearest lug 9 of CO (S-3).

(X) Connect a length of bare wire from lug 2 of tube socket CO (S-2) to the lug protruding through hole FL3 in the chassis (S-1).

(X) R12. Cut both leads of a 470 Ω (yellow-violet-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 3 of tube socket CO (NS) to solder lug CH (NS).

(X) Bend lug 4 of tube socket CO to touch the center post (NS).

(X) Place a length of bare wire through lug 5 (NS) to the center post (S-2, including lug 4) of tube socket CO. Connect the other end of this wire to solder lug CH (NS). Now solder lug 5 of CO (S-2).

(✓) Connect a length of bare wire between lug 3 (S-2) and 8 (S-1) of tube socket CO. Use sleeving.

Refer to Pictorial 13 for the following steps.

(X) Place one end of a length of bare wire through lug 6 (NS) to lug 1 (S-1) of tube socket CO. Use sleeving. Now solder lug 6 (S-2). Connect the other end of this bare wire to lug 1 of IF transformer CD (S-1). Use sleeving.

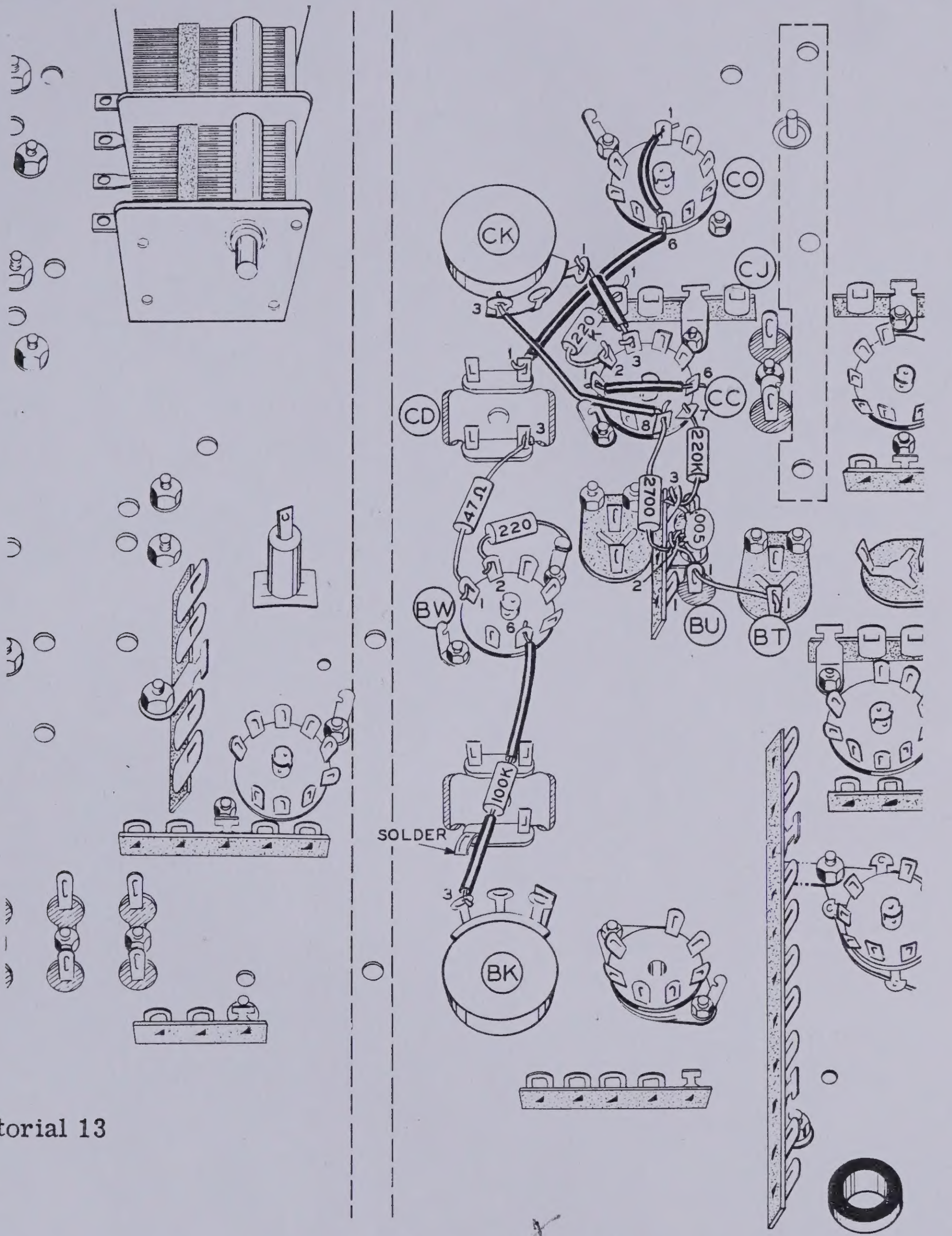
(X) R46. Cut both leads of a 220 KΩ (red-red-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 2 of tube socket CC (S-3) to lug 1 of terminal strip CJ (NS).

(X) R19. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1". Connect this resistor from lug 6 of tube socket BW (S-3) to lug 3 of control BK (S-1). Use sleeving on both leads.

(X) R18. Cut both leads of a 220 Ω (red-red-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of tube socket BW (NS) to the solder lug nearest lug 3 of BW (S-4).

(X) R121. Cut both leads of a 47 Ω (yellow-violet-black) 1/2 watt resistor to 1/2". Connect this resistor from lug 3 of IF transformer CD (S-2) to lug 1 of tube socket BW (S-1).

(X) R48. Cut both leads of a 220 KΩ (red-red-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 7 of tube socket CC (S-3) to lug 3 of the terminal strip attached to crystal socket BU (NS).



Pictorial 13

(✓) R98. Cut both leads of a 2700 Ω (red-violet-red) 1/2 watt resistor to 3/8". Connect this resistor from lug 8 of tube socket CC (NS) to lug 2 of the terminal strip attached to crystal socket BU (NS).

(✓) C150. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of the terminal strip attached to crystal socket BU.

(✓) Connect a length of bare wire from lug 8 of tube socket CC (S-4) to lug 3 of control CK (S-1). Use sleeving.

(✓) Connect a length of bare wire between lugs 6 (S-2) and 1 (NS) of tube socket CC. Use sleeving.

(✓) Connect a length of bare wire from lug 3 of tube socket CC (S-3) to lug 1 of control CK (S-2). Use sleeving.

(✓) Connect a length of bare wire from lug 2 of the terminal strip connected to crystal socket BU (NS) through lug 1 of BU (NS) to lug 1 of trimmer capacitor BT (S-1). Solder lug 1 of BU (S-2).

Refer to Pictorial 14 for the following steps.

NOTE: Keep all components within lines in the dotted areas.

☒ Using long-nose pliers, twist lug 2 of each crystal socket at location DJ 45 degrees. Place a length of bare wire through lug 2 of each crystal socket. Now solder each lug 2 except lug 2 of crystal socket B. Be sure the ground solder lug at lug 2 of crystal socket D is soldered.

☒ C161A. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (S-1) and 2 (NS) of terminal strip DH.

☒ C21. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of terminal strip DL.

☒ C24. Cut both leads of another .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of terminal strip DL.

☒ C103. Cut both leads of another .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor between lugs 3 (S-3) and 5 (NS) of terminal strip DL.

☒ C19. Cut both leads of a 47 μμf resin dipped capacitor to 3/8". Connect this capacitor from lug 7 of tube socket DM (NS) to lug 1 of terminal strip DL (NS).

☒ R25. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 8 of tube socket DM (NS) to the eyelet in lug 3 of terminal strip DL (NS).

☒ R23. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 7 of tube socket DM (NS) to lug 2 of terminal strip DL (S-4).

☒ R27. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 5/8". Connect this resistor from lug 4 of terminal strip DL (NS) to lug 2 of terminal strip DH (NS).

☒ R51. Cut both leads of a 47 KΩ (yellow-violet-orange) 2 watt resistor to 1/2". Place one lead of this resistor through lug 3 (NS) to lug 2 (NS) of terminal strip DH. Connect the other lead of this resistor to lug 5 of terminal strip DL (NS). Now solder lugs 2 (S-3) and 3 (S-6) of DH.

☒ Place a length of bare wire through lug 1 (NS) to the center post (NS) of tube socket DM. Now solder lug 1 of DM (S-2). Connect the other end of this wire to the eyelet in lug 3 of terminal strip EP (S-1).

☒ Place a length of bare wire through lug 4 (NS) to the center post (S-2) of tube socket DM.

☒ C22. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 5 (S-2) of tube socket DM. Position to clear the flange indicated by the dotted line.

☒ C20. Cut both leads of another .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 6 of tube socket DM (NS) to lug 4 of DM (S-3).

☒ R24. Cut both leads of a 360 Ω (orange-blue-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 6 of tube socket DM (S-2) to the solder lug nearest lug 4 of DM (NS).

☒ R50. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 2 of tube socket DM (NS) to the solder lug nearest lug 4 of DM (NS).

☒ C93. Cut both leads of a .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from banana jack DN (NS) to the solder lug nearest lug 4 of tube socket DM (S-3).

☒ RFC10. Cut both leads of an RF parasitic choke (#45-43) wound on a 47 Ω (yellow-violet-black) 1/2 watt resistor, to 3/8". Connect this parasitic choke from lug 3 of tube socket DM (NS) to lug 1 of terminal strip EP (NS).

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socket CC.

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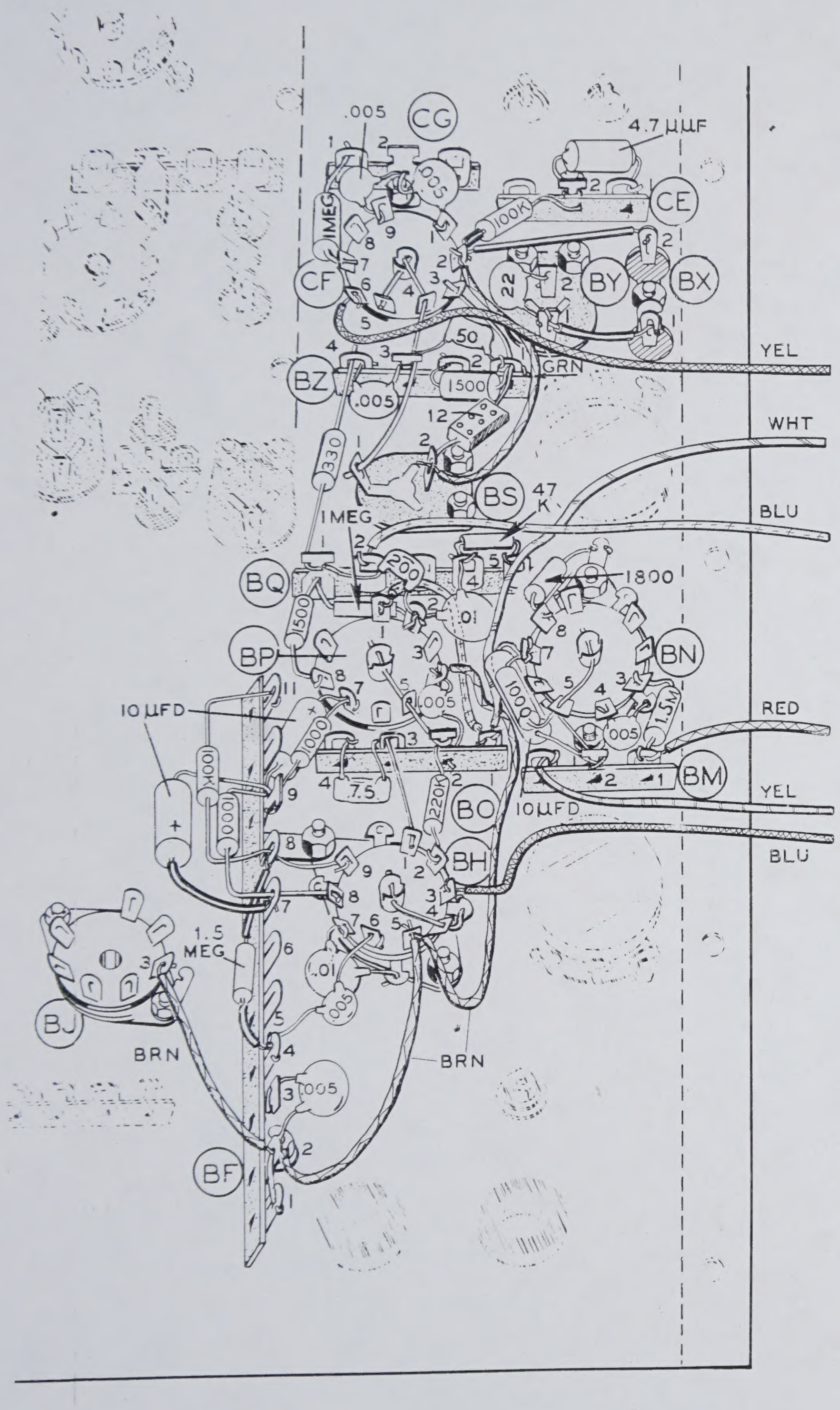
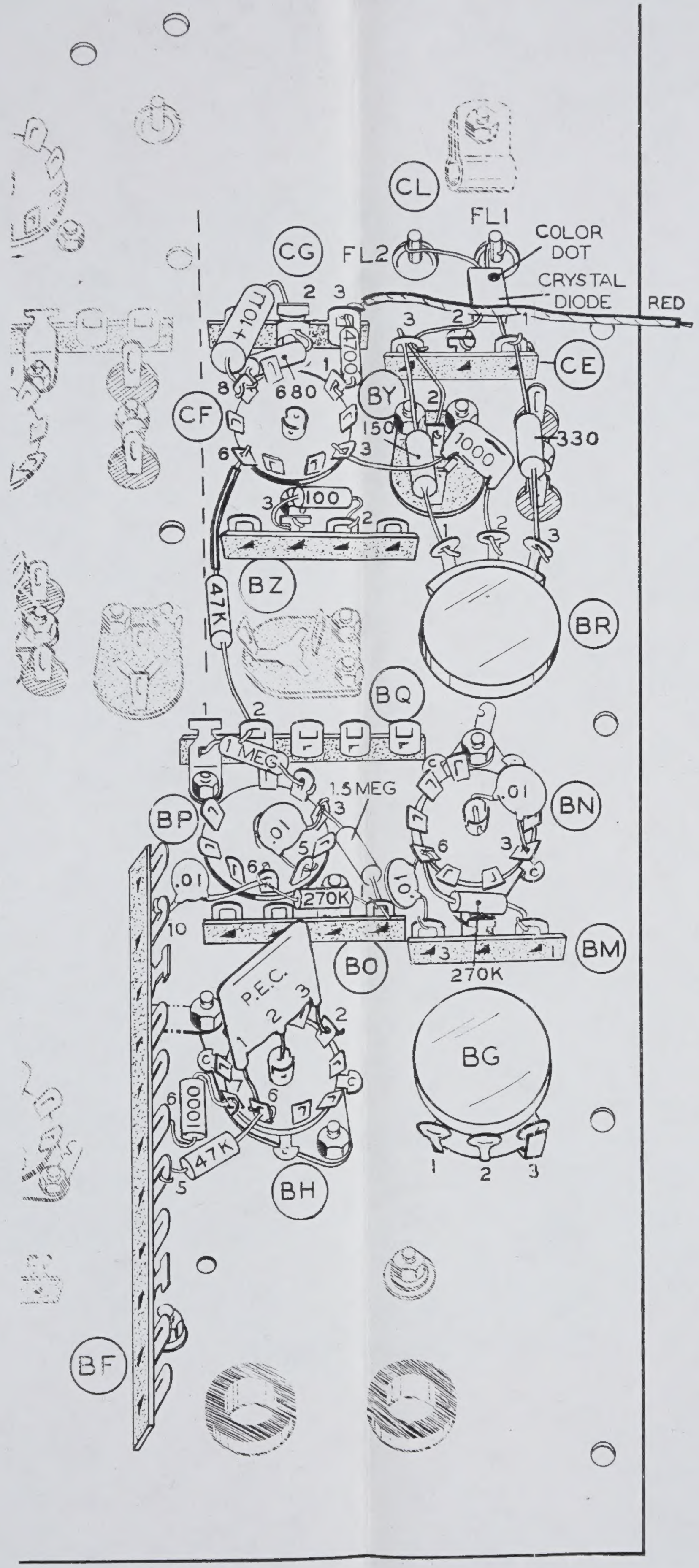
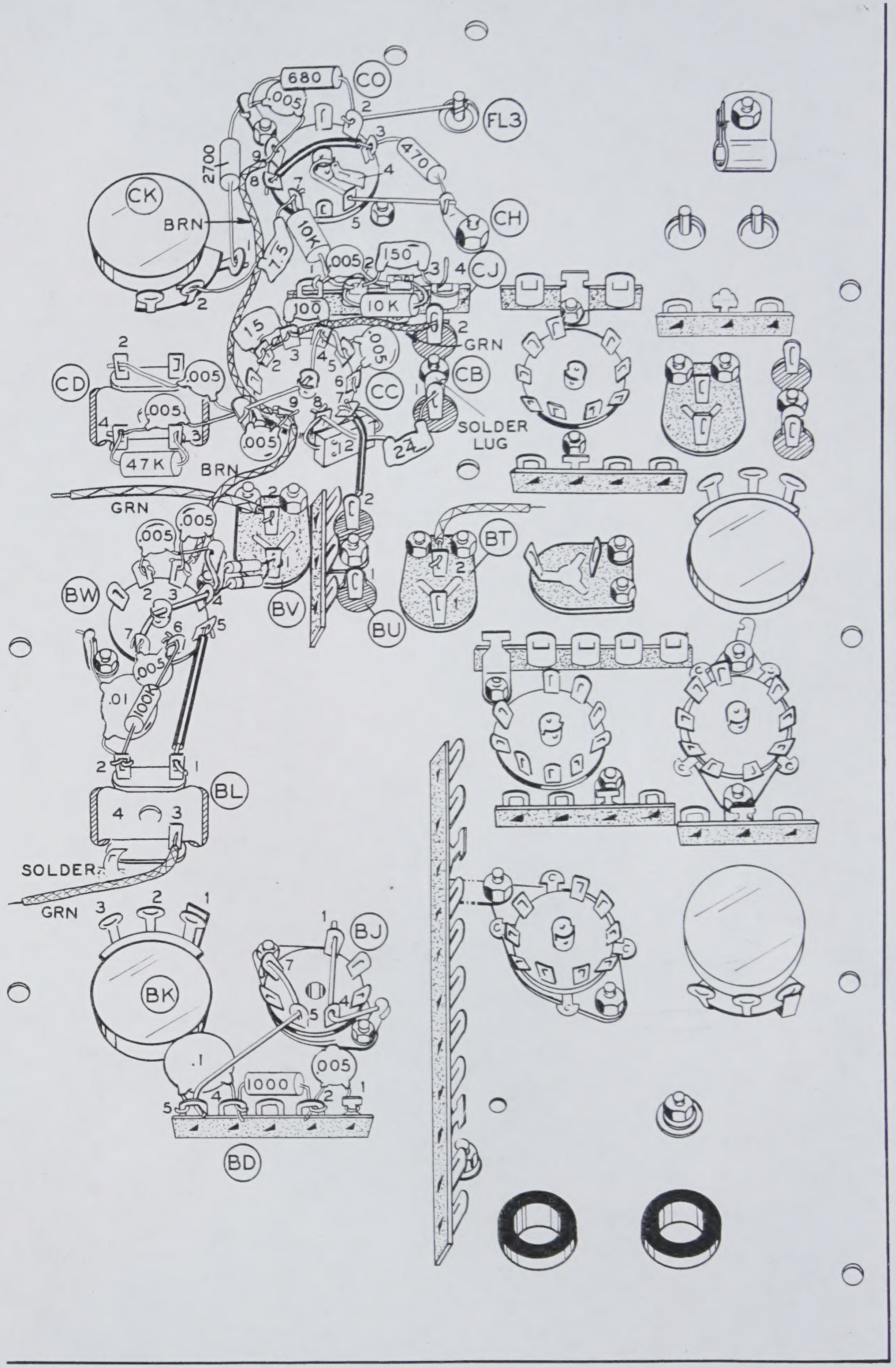
e from lug
d to crystal
BU (NS) to
S-1). Solder



Pictorial 10



Pictorial 11



Pictorial 12

Refer to Pictorial 14 for the following steps.

NOTE: Keep all components within lines in the dotted areas.

(✓) Using long-nose pliers, twist lug 2 of each crystal socket at location DJ 45 degrees. Place a length of bare wire through lug 2 of each crystal socket. Now solder each lug 2 except lug 2 of crystal socket B. Be sure the ground solder lug at lug 2 of crystal socket D is soldered.

(✓) C161A. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (S-1) and 2 (NS) of terminal strip DH.

(✓) C21. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of terminal strip DL.

(✓) C24. Cut both leads of another .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of terminal strip DL.

(✓) C103. Cut both leads of another .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor between lugs 3 (S-3) and 5 (NS) of terminal strip DL.

(✓) C19. Cut both leads of a 47 μμf resin dipped capacitor to 3/8". Connect this capacitor from lug 7 of tube socket DM (NS) to lug 1 of terminal strip DL (NS).

(✓) R25. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 8 of tube socket DM (NS) to the eyelet in lug 3 of terminal strip DL (NS).

(✓) R23. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 7 of tube socket DM (NS) to lug 2 of terminal strip DL (S-4).

(✓) R27. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 5/8". Connect this resistor from lug 4 of terminal strip DL (NS) to lug 2 of terminal strip DH (NS).

(✓) R51. Cut both leads of a 47 KΩ (yellow-violet-orange) 2 watt resistor to 1/2". Place one lead of this resistor through lug 3 (NS) to lug 2 (NS) of terminal strip DH. Connect the other lead of this resistor to lug 5 of terminal strip DL (NS). Now solder lugs 2 (S-3) and 3 (S-6) of DH.

(✓) Place a length of bare wire through lug 1 (NS) to the center post (NS) of tube socket DM. Now solder lug 1 of DM (S-2). Connect the other end of this wire to the eyelet in lug 3 of terminal strip EP (S-1).

(✓) Place a length of bare wire through lug 4 (NS) to the center post (S-2) of tube socket DM.

(✓) C22. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 5 (S-2) of tube socket DM. Position to clear the flange indicated by the dotted line.

(✓) C20. Cut both leads of another .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 6 of tube socket DM (NS) to lug 4 of DM (S-3).

(✓) R24. Cut both leads of a 360 Ω (orange-blue-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 6 of tube socket DM (S-2) to the solder lug nearest lug 4 of DM (NS).

(✓) R50. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 2 of tube socket DM (NS) to the solder lug nearest lug 4 of DM (NS).

(✓) C93. Cut both leads of a .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from banana jack DN (NS) to the solder lug nearest lug 4 of tube socket DM (S-3).

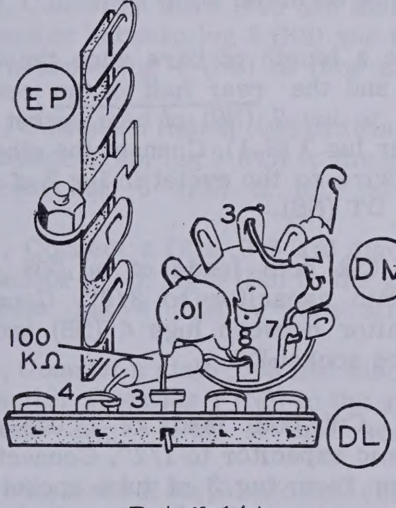
(✓) RFC10. Cut both leads of an RF parasitic choke (#45-43) wound on a 47 Ω (yellow-violet-black) 1/2 watt resistor, to 3/8". Connect this parasitic choke from lug 3 of tube socket DM (NS) to lug 1 of terminal strip EP (NS).

(✓) C30. Cut both leads of a 22 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 5 (NS) of terminal strip EP.

(✓) RFC9. Cut both leads of another RF parasitic choke (#45-43), wound on a 47 Ω (yellow-violet-black) 1/2 watt resistor, to 3/8". Connect this parasitic choke from lug 9 of tube socket DM (S-1) to lug 5 of terminal strip EP (NS).

(✓) R49. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from banana jack DN (S-2) to lug 2 of tube socket DM (NS).

Refer to Detail 14A for the following 3 steps.



Detail 14A

(✓) C18. Cut both leads of a 7.5 μμf resin dipped capacitor to 1/2". Connect this capacitor between lugs 7 (S-3) and 3 (S-2) of tube socket DM. Use care to prevent shorting leads to other tube pins.

(✓) C23. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 8 of tube socket DM (NS) to the eyelet of lug 3 of terminal strip DL (S-2).

(✓) R26. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 8 of tube socket DM (S-3) to lug 4 of terminal strip DL (NS).

Refer to Pictorial 14 for the following steps.

(✓) Connect a bare wire through lug 3 (NS), the center post (NS), lug 7 (NS) of tube socket DQ to the eyelet in lug 3 of terminal strip DR (NS). Solder the center post (S-2).

(✓) C37. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of tube socket DQ.

(✓) C39. Cut both leads of another .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (S-3) and 4 (NS) of tube socket DQ.

(✓) R30. Cut both leads of a 270 Ω (red-violet-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of tube socket DQ (S-2) to the eyelet in lug 2 of terminal strip DO (NS).

(✓) R29. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of tube socket DQ (NS) to the eyelet in lug 2 of terminal strip DO (S-2).

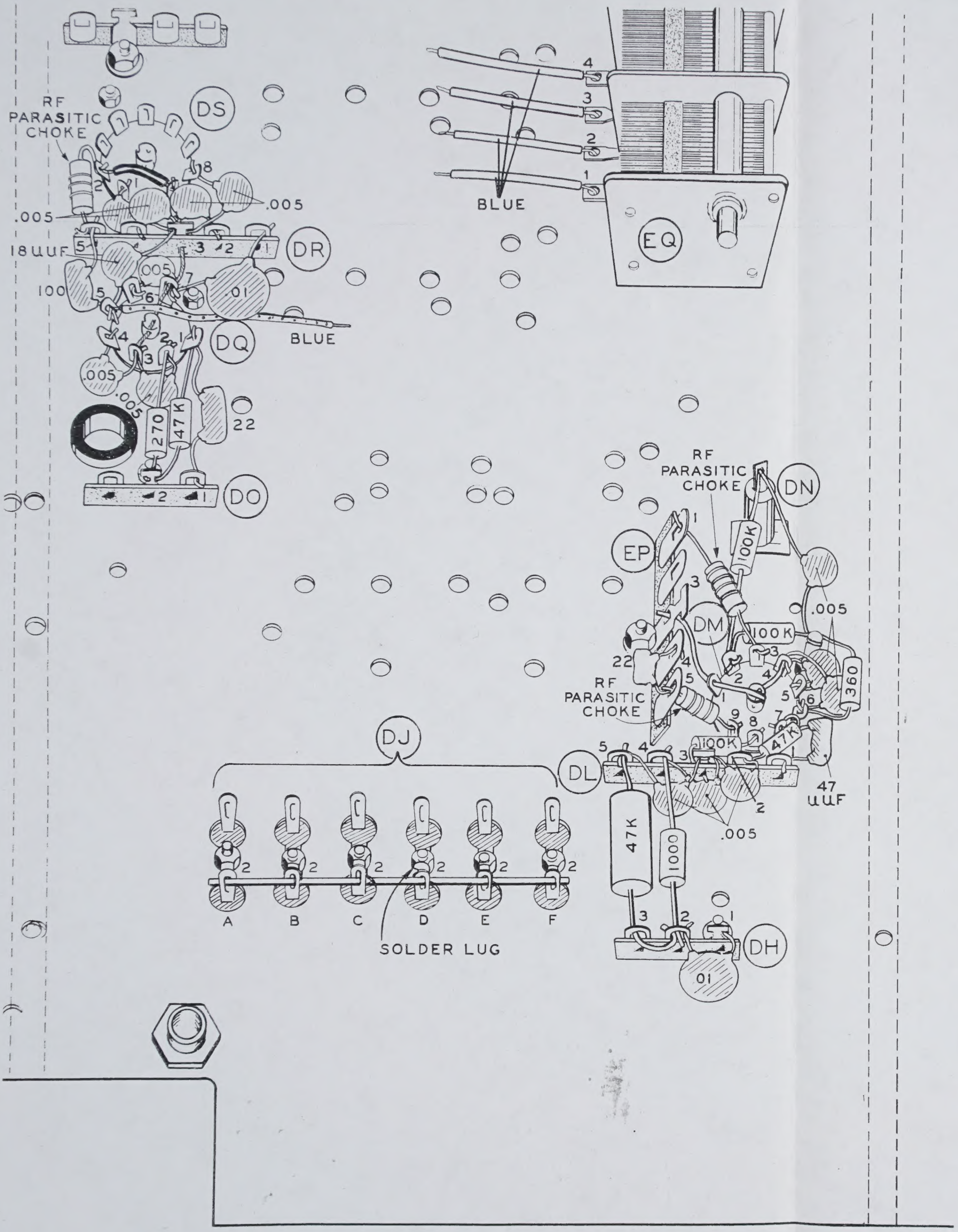
(✓) C35. Cut both leads of a 22 μμf resin dipped mica capacitor to 1/2". Connect this capacitor from lug 1 of tube socket DQ (NS) to lug 1 of terminal strip DO (NS).

(✓) C38. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 7 (NS) and 6 (NS) of tube socket DQ.

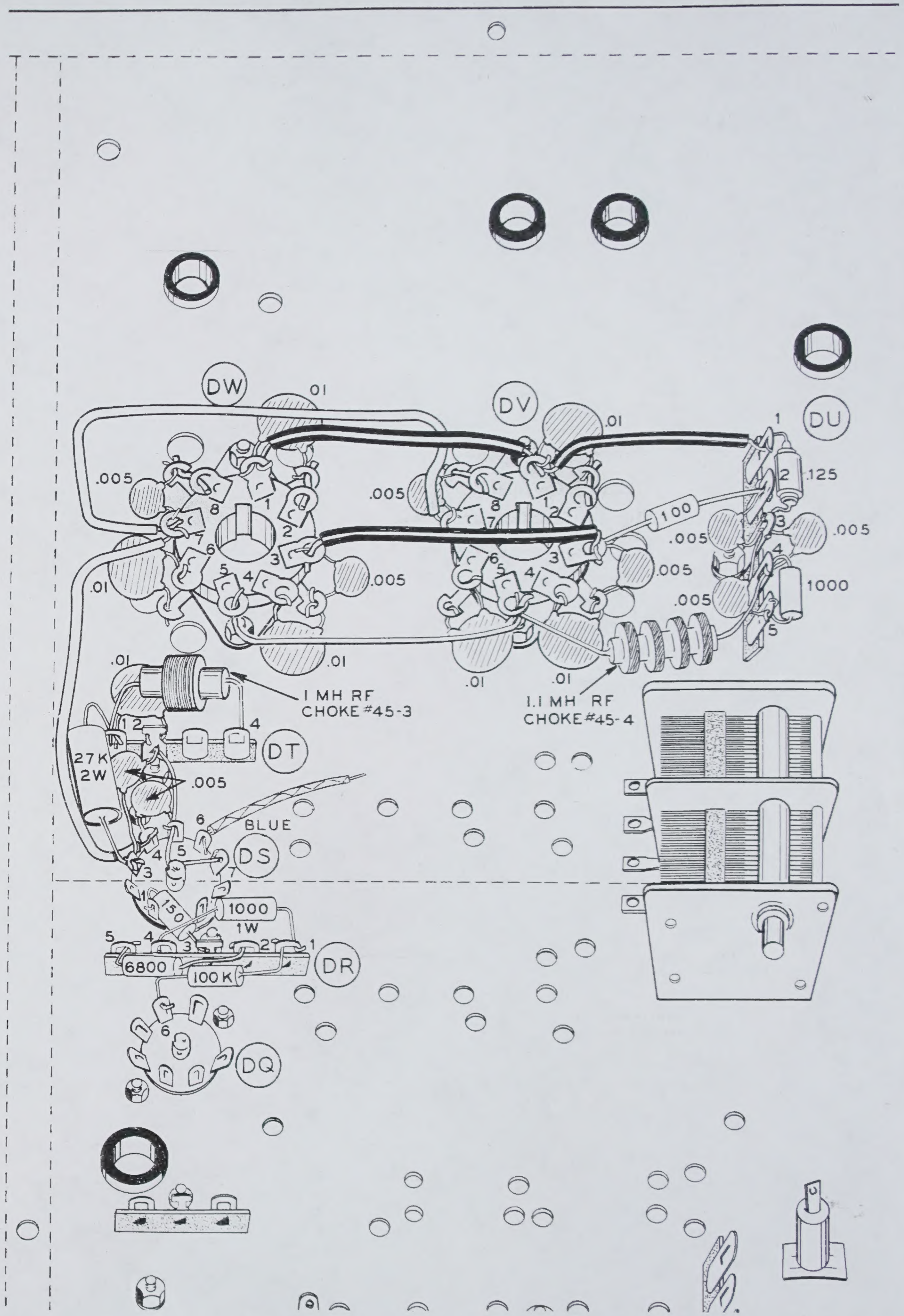
(✓) C36. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 7 of tube socket DQ (S-4) to lug 1 of terminal strip DR (NS).

(✓) C46. Cut both leads of a 100 μμf resin dipped mica capacitor to 3/8". Connect this capacitor from lug 5 of tube socket DQ (NS) to lug 5 of terminal strip DR (NS).

(✓) C50A. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 8 of tube socket DS (S-1) to the eyelet in lug 3 of terminal strip DR (NS).



Pictorial 14



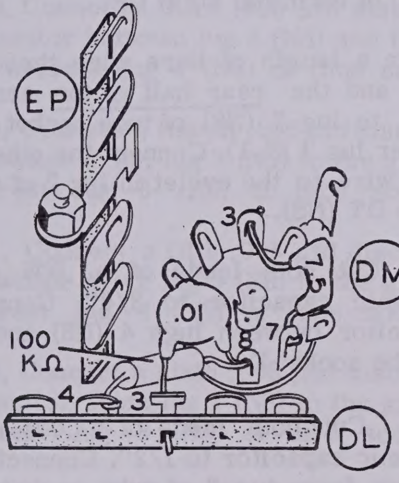
Pictorial 15

(✓) C30. Cut both leads of a 22 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 5 (NS) of terminal strip EP.

(✓) RFC9. Cut both leads of another RF parasitic choke (#45-43), wound on a 47 Ω (yellow-violet-black) 1/2 watt resistor, to 3/8". Connect this parasitic choke from lug 9 of tube socket DM (S-1) to lug 5 of terminal strip EP (NS).

(✓) R49. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from banana jack DN (S-2) to lug 2 of tube socket DM (NS).

Refer to Detail 14A for the following 3 steps.



Detail 14A

(✓) C18. Cut both leads of a 7.5 μμf resin dipped capacitor to 1/2". Connect this capacitor between lugs 7 (S-3) and 3 (S-2) of tube socket DM. Use care to prevent shorting leads to other tube pins.

(✓) C23. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 8 of tube socket DM (NS) to the eyelet of lug 3 of terminal strip DL (S-2).

(✓) R26. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 8 of tube socket DM (S-3) to lug 4 of terminal strip DL (NS).

Refer to Pictorial 14 for the following steps.

(✓) Connect a bare wire through lug 3 (NS), the center post (NS), lug 7 (NS) of tube socket DQ to the eyelet in lug 3 of terminal strip DR (NS). Solder the center post (S-2).

(✓) C37. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of tube socket DQ.

(✓) C39. Cut both leads of another .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (S-3) and 4 (NS) of tube socket DQ.

(✓) R30. Cut both leads of a 270 Ω (red-violet-brown) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of tube socket DQ (S-2) to the eyelet in lug 2 of terminal strip DO (NS).

(✓) R29. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of tube socket DQ (NS) to the eyelet in lug 2 of terminal strip DO (S-2).

(✓) C35. Cut both leads of a 22 μμf resin dipped mica capacitor to 1/2". Connect this capacitor from lug 1 of tube socket DQ (NS) to lug 1 of terminal strip DO (NS).

(✓) C38. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 7 (NS) and 6 (NS) of tube socket DQ.

(✓) C36. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 7 of tube socket DQ (S-4) to lug 1 of terminal strip DR (NS).

(✓) C46. Cut both leads of a 100 μμf resin dipped mica capacitor to 3/8". Connect this capacitor from lug 5 of tube socket DQ (NS) to lug 5 of terminal strip DR (NS).

(✓) C50A. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 8 of tube socket DS (S-1) to the eyelet in lug 3 of terminal strip DR (NS).

(✓) C48. Cut both leads of another .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 1 of tube socket DS (NS) to the eyelet in lug 3 of terminal strip DR (S-3).

(✓) C47. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of terminal strip DR.

(✓) C139. Cut both leads of an 18 μμf disc ceramic capacitor to 1/2". Connect this capacitor from lug 5 of tube socket DQ (NS) to lug 3 of terminal strip DR (NS).

(✓) Connect a 3-5/8" length of blue hookup wire to lug 5 of tube socket DQ (S-3). Leave the other end free.

(✓) C25. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of terminal strip DR.

(✓) RFC1. Cut one lead of an RF parasitic choke (#45-43), wound on a 47 Ω (yellow-violet-black) 1/2 watt resistor, to 3/8". Pass the uncut lead through lug 2 (NS) to lug 9 (S-1) of tube socket DS. Use sleeving. Connect the other lead of this choke to lug 5 of terminal strip DR (NS). Now solder lug 2 of tube socket DS (S-2).

(✓) Connect a 1-3/4" length of blue hookup wire to lug 1 of capacitor EQ (S-1). Leave the other end free.

(✓) Connect a 1-3/4" length of blue hookup wire to lug 2 of capacitor EQ (S-1). Leave the other end free.

(✓) Connect a 1-3/4" length of blue hookup wire to lug 3 of capacitor EQ (S-1). Leave the other end free.

(✓) Connect a 1-1/2" length of blue hookup wire to lug 4 of capacitor EQ (S-1). Leave the other end free.

Refer to Pictorial 15 (fold-out from Page 56) for the following steps. Keep all components within the dotted areas.

(✓) R32. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 6 of tube socket DQ (S-2) to lug 1 of terminal strip DR (NS).

(✓) R34. Cut both leads of a 150 Ω (brown-green-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 1 of tube socket DS (S-2) to lug 3 of terminal strip DR (S-4).

(✓) R31. Cut both leads of a 1000 Ω (brown-black-red) 1 watt resistor to 1/2". Connect this resistor between lugs 1 (NS) and 4 (NS) of terminal strip DR.

(✓) R33. Cut both leads of a 6800 Ω (blue-gray-red) 1/2 watt resistor to 1/2". Connect this resistor between lugs 2 (NS) and 5 (S-3) of terminal strip DR.

(✓) Place a length of bare wire through lug 5 (NS) and the rear half of the center post (NS), to lug 7 (NS) of tube socket DS. Now solder lug 7 (S-1). Connect the other end of this wire to the eyelet in lug 2 of terminal strip DT (NS).

(✓) C49. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 4 (NS) and 5 (S-3) of tube socket DS.

(✓) C50. Cut both leads of a .005 μfd disc ceramic capacitor to 1/2". Connect this capacitor from lug 3 of tube socket DS (NS) to the eyelet in lug 2 of terminal strip DT (S-2).

(✓) Connect a 3-1/2" length of blue hookup wire to lug 6 of tube socket DS (S-1). Leave the other end free.

(✓) C56. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of terminal strip DT.

(✓) R35. Cut both leads of a 27 KΩ (red-violet-orange) 2 watt resistor to 1/2". Connect this resistor from lug 1 of terminal strip DT (NS) to lug 3 of tube socket DS (S-2). Dress this resistor as shown in Pictorial 15. It must clear both the flange and the tube shield to be installed later.

(✓) RFC2. Cut both leads of an RF choke (#45-3) to 3/4". Connect this choke between lugs 1 (NS) and 4 (NS) of terminal strip DT.

(✓) Cut both leads of six .005 μfd disc ceramic capacitors to 1/2".

Connect these six capacitors as indicated in the following steps.

(✓) C165. Connect a .005 μfd disc ceramic capacitor between lugs 2 (NS) and 3 (NS) of terminal strip DU.

(✓) C59. Connect a second .005 μfd disc ceramic capacitor between lugs 3 (NS) and 5 (NS) of terminal strip DU.

(✓) C70. Connect a third .005 μfd disc ceramic capacitor between lug 3 (NS) and the ground lug nearest lug 4 (NS) of tube socket DV.

(✓) C69. Connect a fourth .005 μfd disc ceramic capacitor from lug 7 (NS) to the ground lug nearest lug 8 (NS) of tube socket DV.

(✓) C71. Connect a fifth .005 μfd disc ceramic capacitor from lug 3 (NS) to the ground lug nearest lug 4 (NS) of tube socket DW.

(✓) C74. Connect a sixth .005 μfd disc ceramic capacitor from lug 7 (NS) to the ground lug nearest lug 8 (NS) of tube socket DW.

(✓) Cut both leads of six .01 μfd disc ceramic capacitors to 3/8".

Connect these capacitors as indicated in the following steps.

(✓) C158. Connect a .01 μfd disc ceramic capacitor from lug 6 (S-1) to the ground lug nearest lug 6 (S-1) of tube socket DW.

(✓) C72. Connect a second .01 μfd disc ceramic capacitor from lug 4 (S-1) to the ground lug nearest lug 4 (S-2) of tube socket DW.

(✓) C73. Connect a third .01 μfd disc ceramic capacitor from lug 1 (NS) to the ground lug nearest lug 2 (NS) of tube socket DW.

(✓) C157. Connect a fourth .01 μfd disc ceramic capacitor from lug 6 (S-1) to the ground lug nearest lug 6 (S-1) of tube socket DV.

(✓) C64. Connect a fifth .01 μfd disc ceramic capacitor from lug 4 (S-1) to the ground lug nearest lug 4 (S-2) of tube socket DV.

(✓) C65. Connect a sixth .01 μfd disc ceramic capacitor from lug 1 (NS) to the ground lug nearest lug 2 (NS) of tube socket DV.

(✓) Connect a 3-1/2" brown hookup wire from lug 4 of tube socket DS (S-2) to lug 7 of tube socket DW (NS).

(✓) Connect a 4-1/4" brown hookup wire from lug 7 of tube socket DV (S-2) to lug 7 of tube socket DW (NS).

(✓) Connect a short length of #16 bare wire from lug 2 (S-1) to the ground lug nearest lug 2 (S-2) of tube socket DW.

(✓) Connect a short length of #16 bare wire from lug 8 (S-1) to the ground lug nearest lug 8 (S-2) of tube socket DW.

(✓) Connect a short length of #16 bare wire from lug 2 (S-1) to the ground lug nearest lug 2 (S-2) of tube socket DV.

(✓) Connect another short length of #16 bare wire from lug 8 (S-1) to the ground lug nearest lug 8 (S-2) of tube socket DV.

(✓) Connect a length of #16 bare wire from lug 1 of tube socket DV (NS) to lug 1 of terminal strip DU (NS). Use sleeving.

(✓) Connect a length of #16 bare wire from lug 1 of tube socket DV (S-3) to lug 1 of tube socket DW (S-2). Use sleeving.

(✓) Connect a length of #16 bare wire from lug 3 of tube socket DW (S-2) to lug 3 of tube socket DV (NS). Use sleeving.

(✓) Connect a length of #16 bare wire from lug 5 of tube socket DV (NS) to lug 5 of tube socket DW (S-1). Form this wire and place it as shown in Pictorial 15.

(✓) R37. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 3/8". Connect this resistor between lugs 4 (NS) and 5 (NS) of terminal strip DU.

☒ C61. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (NS) of terminal strip DU.

☒ R97. Cut both leads of a 100 Ω (brown-black-brown) 1/2 watt resistor to 3/4". Connect this resistor from lug 2 of terminal strip DU (NS) to lug 3 of tube socket DV (S-3).

☒ RFC3. Cut both leads of a 1.1 mh RF choke (#45-4) to 3/4". Connect this choke from lug 4 of terminal strip DU (S-3) to lug 5 of tube socket DV (S-2). Position this choke close to the chassis as shown in Pictorial 15.

☒ R39. Cut both leads of a .125 Ω precision resistor to 1/2". Connect this resistor between lugs 1 (NS) and 3 (S-4) of terminal strip DU.

Refer to Pictorial 16 for the following steps.

☒ R94. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor between lugs 3 (NS) and 4 (NS) of terminal strip FV.

☒ R91. Cut both leads of a 68 KΩ (blue-gray-orange) 1/2 watt resistor to 3/8". Connect this resistor between lugs 1 (NS) and 2 (S-2) of terminal strip FV.

☒ R93. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/4". Connect this resistor between lugs 1 (NS) and 4 (S-3) of terminal strip FV. Use sleeving on both leads.

☒ R75. Cut both leads of another 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1". Connect this resistor between lugs 1 (NS) and 5 (S-2) of terminal strip FV. Use sleeving on both leads.

☒ R90. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 3/8". Connect this resistor between lugs 1 (S-2) and 2 (NS) of terminal strip FW.

☒ R76. Cut both leads of a 1500 Ω (brown-green-red) 1/2 watt resistor to 3/8". Connect this resistor between lugs 4 (NS) and 5 (NS) of terminal strip FW.

☒ R89. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 3/4". Connect this resistor between lugs 2 (NS) and 5 (NS) of terminal strip FW. Use sleeving on both leads.

☑ R96. Cut both leads of an 18 KΩ (brown-gray-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 2 of terminal strip FW (S-3) to lug 4 of terminal strip FX (NS).

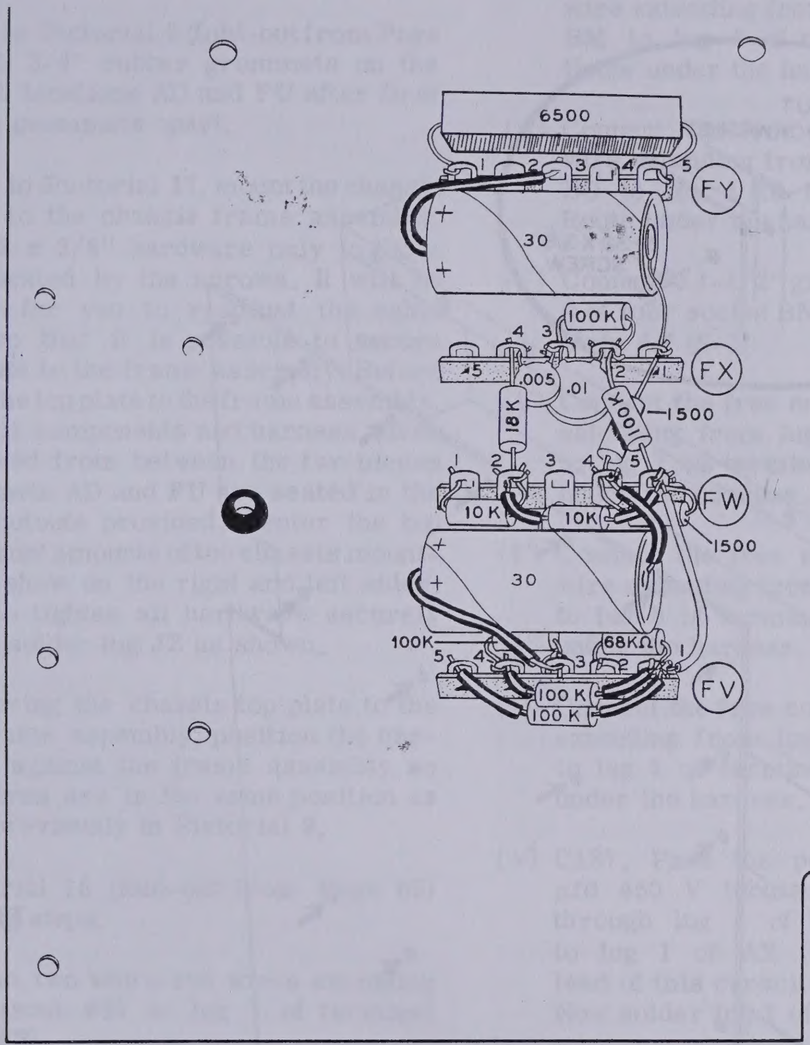
☒ R101. Cut both leads of a 1500 Ω (brown-green-red) 1/2 watt resistor to 3/8". Connect this resistor from lug 4 of terminal strip FW (NS) to lug 1 of terminal strip FX (NS).

☒ R86. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor from lug 5 of terminal strip FW (NS) to lug 2 of terminal strip FX (NS).

☒ C138B. Connect the positive (+) lead of a 30 μfd tubular electrolytic capacitor to lug 3 of terminal strip FV (S-2). Use sleeving. Connect the other lead of this capacitor to lug 4 of terminal strip FW (S-3). Use sleeving.

☒ Connect a 2-1/2" length of gray hookup wire from lug 1 of terminal strip FV (S-4) to lug 5 of terminal strip FW (S-5).

☒ C140. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 3 (NS) and 4 (S-3) of terminal strip FX.



Pictorial 16

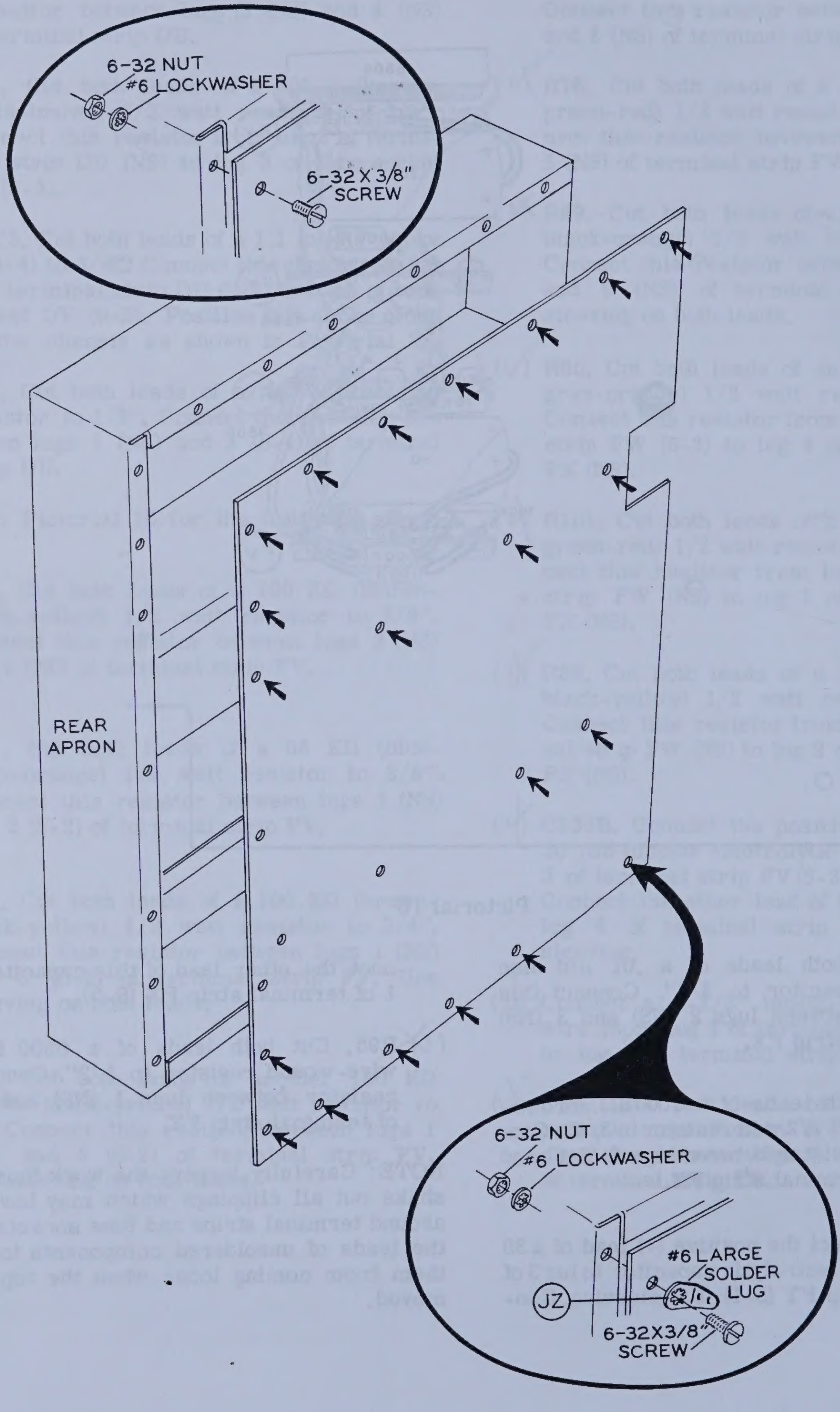
(✓) C145. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (NS) and 3 (NS) of terminal strip FX.

(✓) R87. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor between lugs 2 (S-6) and 3 (S-3) of terminal strip FX.

(✓) C138A. Connect the positive (+) lead of a 30 μfd tubular electrolytic capacitor to lug 3 of terminal strip FY (S-1). Use sleeving. Connect the other lead of this capacitor to lug 1 of terminal strip FX (S-3).

(✓) R95. Cut both leads of a 6500 Ω 7 watt wire-wound resistor to 1/2". Connect this resistor between lugs 1 (NS) and 5 (S-5) of terminal strip FY.

NOTE: Carefully inspect the work thus far and shake out all clippings which may have lodged around terminal strips and tube sockets. Crimp the leads of unsoldered components to prevent them from coming loose when the top plate is moved.



Pictorial 17

WIRING CHASSIS FRAME TO TOP PLATE

(✓) Referring to Pictorial 9 (fold-out from Page 46), install 3/4" rubber grommets on the harness at locations AD and FU after first cutting the grommets apart.

(✓) Referring to Pictorial 17, mount the chassis top plate to the chassis frame assembly, using 6-32 x 3/8" hardware only in those holes indicated by the arrows. It will be necessary for you to readjust the cable harness so that it is possible to secure the top plate to the frame assembly. Before securing the top plate to the frame assembly, be sure all components and harness wires are removed from between the two pieces and grommets AD and FU are seated in the partition cutouts provided. Center the top plate so equal amounts of the chassis mounting holes show on the right and left sides. Be sure to tighten all hardware securely and mount solder lug JZ as shown.

(✓) After securing the chassis top plate to the chassis frame assembly, position the harness wire against the frame assembly so that all wires are in the same position as indicated previously in Pictorial 9.

Refer to Pictorial 18 (fold-out from Page 65) for the following steps.

(✓) Connect the two white-red wires extending from Breakout #35 to lug 1 of terminal strip AY (NS).

(✓) Connect the white-yellow wire extending from Breakout #36 to lug 4 of terminal strip AX (S-2).

(✓) Connect the free end of the blue hookup wire extending from lug 3 of tube socket BH to lug 6 of terminal strip AY (S-3). Route under the harness.

(✓) Connect a 2" red hookup wire from lug 8 of tube socket BN (S-2) to lug 5 of terminal strip AY (S-3).

(✓) Connect the free end of the red hookup wire extending from lug 1 of terminal strip BM to lug 2 of terminal strip AY (NS). Route under the harness.

(✓) Connect the free end of the yellow hookup wire extending from lug 3 of terminal strip BM to lug 3 of terminal strip AY (S-3). Route under the harness.

(✓) Connect the free end of the white hookup wire extending from lug 1 of terminal strip BO to lug 1 of terminal strip AX (NS). Route under the harness.

(✓) Connect a 1-1/2" green hookup wire from lug 9 of tube socket BN (S-3) to lug 5 of terminal strip AX (S-3).

(✓) Connect the free end of the blue hookup wire extending from lug 2 of terminal strip BQ to lug 1 of terminal strip AY (S-5). Route under the harness.

(✓) Connect the free end of the yellow hookup wire extending from lug 6 of tube socket CF to lug 5 of terminal strip AW (S-2). Route under the harness.

(✓) Connect the free end of the red hookup wire extending from lug 3 of terminal strip CG to lug 1 of terminal strip AW (NS). Route under the harness.

(✓) C137. Pass the positive (+) lead of a 20 μfd 450 V tubular electrolytic capacitor through lug 1 of terminal strip AW (NS) to lug 1 of AX (S-3). Connect the other lead of this capacitor to solder lug AU (S-1). Now solder lug 1 of AW (S-3).

(✓) Connect the heavy white-blue lead extending from Breakout #40 to lug 1 of terminal strip AT (NS).

(✓) Connect the heavy blue lead extending from Breakout #40 to lug 2 of terminal strip AT (NS).

(✓) Connect the white-violet lead extending from Breakout #28 to lug 1 of key jack AS (S-1).

(✓) Connect the white-black-green lead extending from Breakout #41 to lug 1 of AC socket AQ (NS).

(✓) Connect the black lead with green band extending from Breakout #41, to lug 1 of AC receptacle AQ (NS).

(✓) Connect a 2-1/2" black hookup wire from lug 1 of AC receptacle CW (S-1) to lug 1 of AC receptacle AQ (S-4).

(✓) Connect a 2-1/2" black hookup wire from lug 2 of AC receptacle CW (S-1) to lug 2 of AC receptacle AQ (S-2).

(✓) Connect the white-violet lead extending from Breakout #41 to lug 5 of octal socket AP (S-2).

(✓) Connect the white-yellow-orange lead extending from Breakout #41 to lug 4 of octal socket AP (S-1).

(✓) Connect the white-blue lead extending from Breakout #41 to lug 3 of the octal socket AP (S-2).

(✓) Connect the white-yellow lead extending from Breakout #41 to lug 2 of octal socket AP (S-1).

(✓) Connect the black lead with white band extending from Breakout #41 to lug 7 of octal socket AP (S-3).

(✓) Connect the white-gray lead extending from Breakout #41 to lug 8 of octal socket AP (S-2).

(✓) Connect the white-brown-brown lead extending from Breakout #41 to lug 1 of octal socket AP (S-1).

(✓) Place the free end of the white-brown-brown lead extending from Breakout #26 through grommet AN. It will be connected later.

(✓) Connect one end of a 3-1/2" blue hookup wire to lug 5 of tube socket CT (S-2). Place the free end of this wire through grommet AM. It will be connected later.

(✓) Place the free end of the white-green lead extending from Breakout #25 through grommet AL. It will be connected later.

(✓) Connect the white-violet lead extending from Breakout #24 to lug 5 of terminal strip AJ (NS).

(✓) Connect the white-gray-black lead extending from Breakout #23 to lug 4 of terminal strip AH (NS).

(✓) Connect the white-orange lead extending from Breakout #23 to lug 2 of terminal strip AH (NS).

(✓) Connect the white-green-gray lead extending from Breakout #23 to lug 1 of terminal strip AH (NS).

(✓) Connect the white-red lead extending from Breakout #22 to lug 1 of terminal strip AG (NS).

(✓) R15. Cut one lead of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/4", and the other lead to 3/8". Connect the long lead of this resistor to lug 2 of IF transformer CD (S-2). Connect the other lead to lug 2 of terminal strip AJ (NS).

(✓) R99. Cut both leads of a 220 KΩ (red-red-yellow) 1/2 watt resistor to 3/4". Connect this resistor from lug 1 of terminal strip CJ (NS) to lug 1 of terminal strip AJ (S-2).

(✓) R106. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/4". Connect this resistor from lug 1 of tube socket CC (S-2) to lug 2 of terminal strip AJ (S-4).

(✓) R92A. Connect a 47 KΩ (yellow-violet-orange) 1/2 watt resistor from lug 1 of trimmer capacitor BV (S-2) to lug 5 of terminal strip AJ (S-4). Use sleeving on both leads.

(✓) Pass the green wire connected to lug 3 of IF transformer BL through grommet AE. It will be connected later.

(X) R16. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 3/4". Connect this resistor from lug 4 of IF transformer CD (S-3) to lug 4 of terminal strip AH (S-3).

(✓) Connect a 1-1/2" yellow hookup wire from lug 2 of tube socket BW (S-3) to lug 2 of terminal strip AH (S-4).

(X) R100. Cut both leads of a 220 KΩ (red-red-yellow) 1/2 watt resistor to 1". Connect this resistor from lug 3 of the terminal strip attached to crystal socket BU (NS) to lug 1 of terminal strip AH (S-3).

(✓) Connect the white-red lead extending from Breakout #21 to lug 4 of terminal strip AF (S-4).

(X) R21. Cut both leads of a 1000 Ω (brown-black-red) 1/2 watt resistor to 1/2". Connect this resistor from lug 2 of IF transformer BL (S-3) to lug 1 of terminal strip AG (S-4).

(✓) Connect a 2" gray hookup wire from lug 2 of control BK (NS) to lug 2 of terminal strip AG (S-2).

Refer to Pictorial 19 for the following steps.

(✓) Place the white-green, white-red and white-brown leads extending from Breakout #13 through grommet FT. They will be connected later.

(✓) Place the white-red lead extending from Breakout #14 through grommet FR. It will be connected later.

(✓) Place the white-red-red lead extending from Breakout #15 through grommet FM. It will be connected later.

(✓) Place the black lead extending from Breakout #15 through grommet FP. It will be connected later.

(✓) Connect the three white-brown leads extending from Breakout #4 to the eyelet of lug 4 of terminal strip FE (S-3).

(✓) Connect the two black leads extending from Breakout #4 to lug 4 of terminal strip FE (NS).

(✓) Connect the two black leads with white bands extending from Breakout #4 to lug 1 of terminal strip FE (NS).

(✓) Connect the two black leads with green bands extending from Breakout #4 to lug 2 of terminal strip FE (NS).

(✓) Connect the two black leads with orange bands extending from Breakout #4 to lug 5 of terminal strip FE (NS).

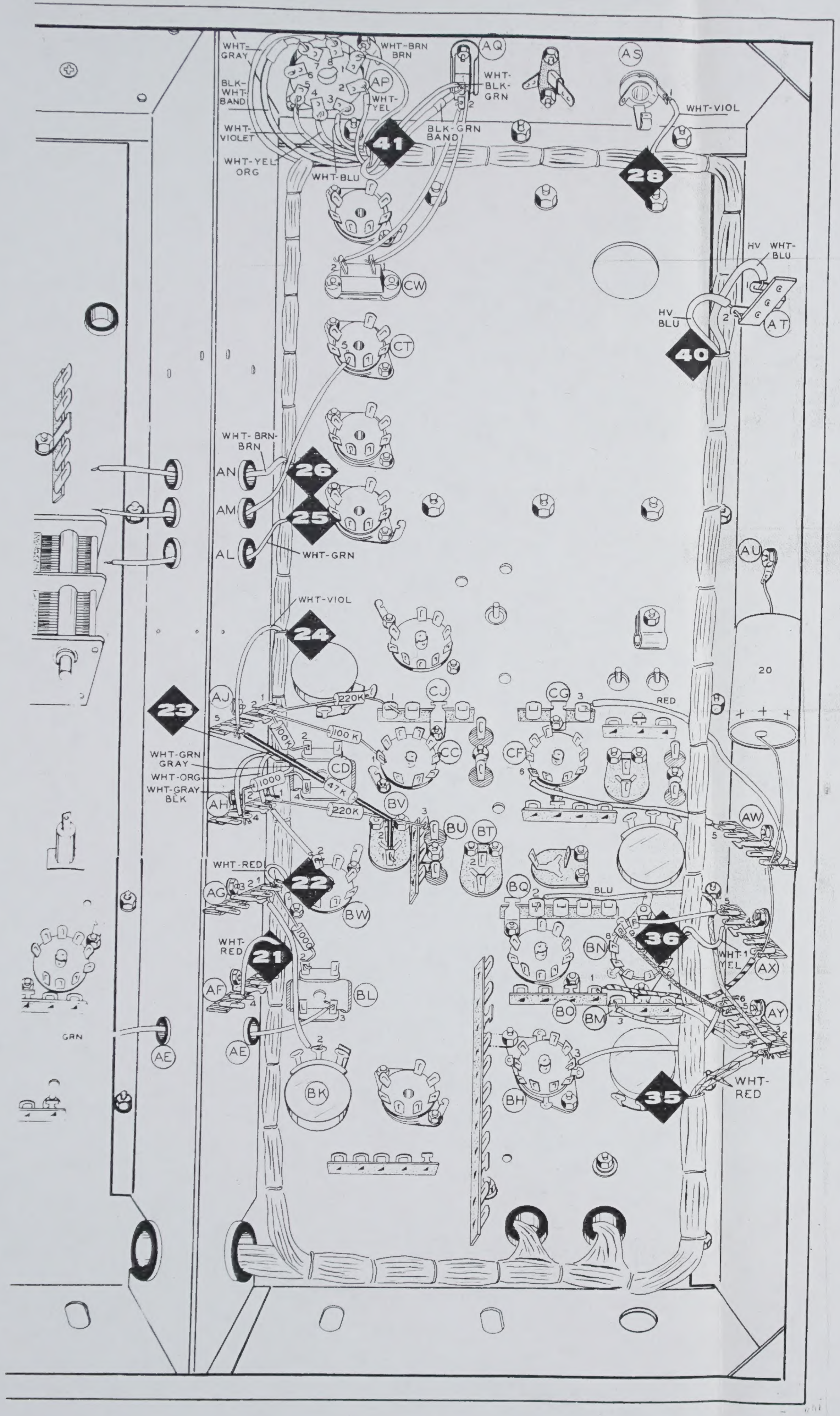
(✓) Connect the white-gray lead extending from Breakout #2 to lug 1 of terminal strip FH (S-3).

(✓) Connect the black lead with white band extending from Breakout #1 to lug 1 of terminal strip FJ (NS).

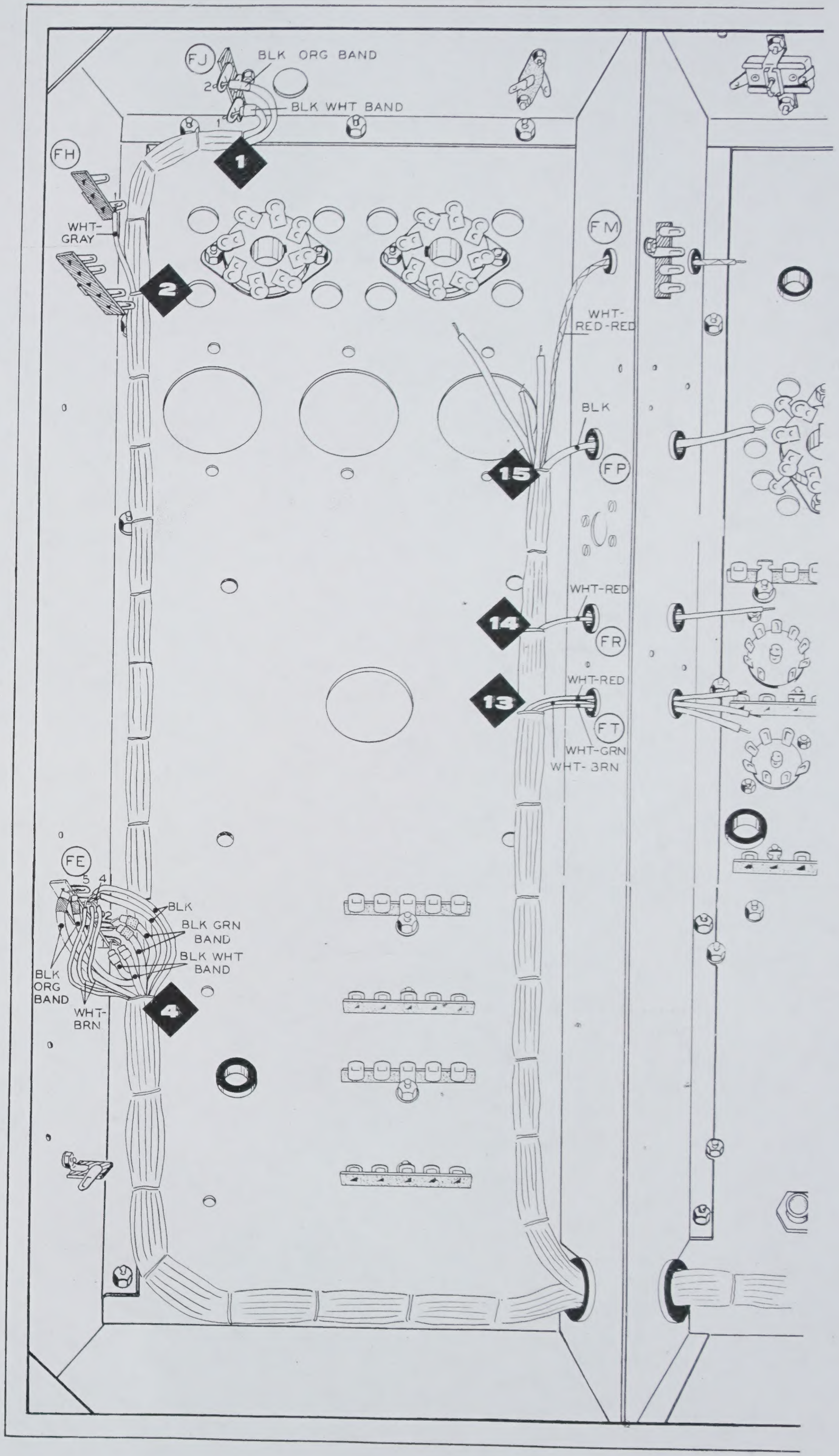
(✓) Connect the black lead with orange band extending from Breakout #1 to lug 2 of terminal strip FJ (NS).

(✓) Set the chassis aside temporarily.

A
B



Pictorial 18

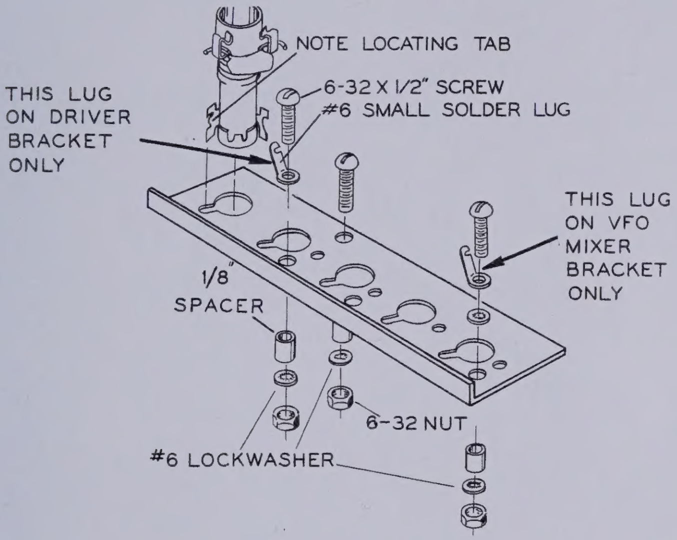


Pictorial 19

Refer to Detail 20A for the following steps.

(✓) Locate two each of coils #40-360 through #40-364 and the DRIVER and VFO MIXER coil mounting brackets #204-387.

(✓) Position both of the coil mounting brackets as shown in Detail 20A.



Detail 20A

(✓) Install the mounting hardware, consisting of three 6-32 x 1/2" round head screws, 1/8" spacers, two #6 small solder lugs (one on each bracket as marked), #6 lockwashers and 6-32 nuts at the locations shown on both brackets.

Refer to Detail 20B for the following steps.

(✓) C40-51. Cut both leads of two 50 $\mu\mu$f resin dipped mica capacitors to 3/8". Connect a capacitor between lugs 1 (NS) and 2 (NS) of each coil, L2 and L7 (#40-364).

(✓) C41-52. Cut both leads of two 68 $\mu\mu$f resin dipped mica capacitors to 3/8". Connect a capacitor between lugs 1 (NS) and 2 (NS) of each coil, L3 and L8 (#40-363).

(✓) C42-53. Cut both leads of two 90 $\mu\mu$f resin dipped mica capacitors to 3/8". Connect a capacitor between lugs 1 (NS) and 2 (NS) of each coil, L4 and L9 (#40-362).

(✓) C43-54. Cut both leads of two 68 $\mu\mu$f resin dipped mica capacitors to 3/8". Connect a capacitor between lugs 1 (NS) and 2 (NS) of each coil, L5 and L10 (#40-361).

(✓) C44-55. Cut both leads of two 270 $\mu\mu$f resin dipped mica capacitors to 3/8". Connect a capacitor between lugs 1 (NS) and 2 (NS) of each coil, L6 and L11 (#40-360).

(✓) L2 through L11. Referring to Details 20A and 20B, mount coils L2 through L6 on one bracket and L7 through L11 on the remaining bracket as shown.

(✓) C146. Cut both leads of a 680 $\mu\mu$f resin dipped mica capacitor to 1/2". Connect one lead to lug 1 of coil L8 (NS). Connect the other lead to the adjacent #6 ground lug (S-1).

NOTE: In each of the following steps the free end of each wire connected should be placed through the small hole in the coil mounting bracket next to the coil, as shown in Detail 20B.

(✓) (✓) Connect a 2-5/8" white hookup wire to lug 2 (S-2) of each coil, L2 and L7 (#40-364).

(✓) (✓) Connect a 4-1/8" yellow hookup wire to lug 2 (S-2) of each coil, L3 and L8 (#40-363).

(✓) (✓) Connect a 4-1/2" orange hookup wire to lug 2 (S-2) of each coil, L4 and L9 (#40-362).

(✓) (✓) Connect a 4-1/2" green hookup wire to lug 2 (S-2) of each coil, L5 and L10 (#40-361).

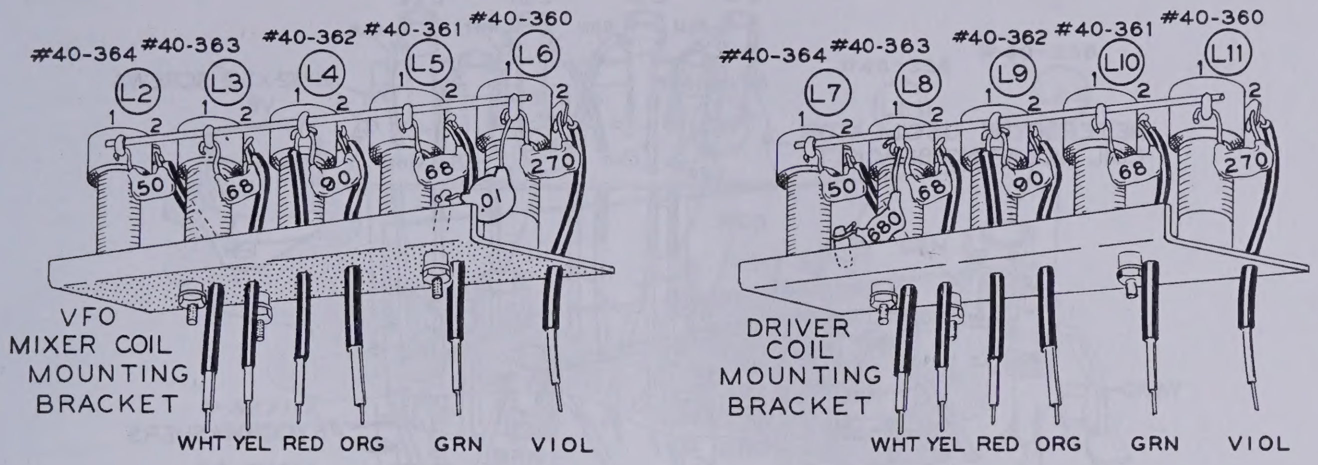
(✓) (✓) Connect a 4-1/2" violet hookup wire to lug 2 (S-2) of each coil, L6 and L11 (#40-360).

(✓) (✓) Connect a 4-1/4" red hookup wire to lug 1 (NS) of each coil, L4 and L9 (#40-362).

(✓) C40A. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 1 of coil L6 (NS). Connect the other lead to the adjacent #6 ground lug (S-1).

(✓) Place a length of bare wire through lug 1 of each coil. Now solder lug 1 of each coil.

NOTE: Be sure these brackets are mounted in their correct positions as in Pictorial 20 since they are now dissimilar.



NOTE: Place all sleeving on leads after mounting to top plate.

Detail 20B

(✓) Referring to Detail 20A and Pictorial 20, mount the DRIVER and VFO MIXER coil brackets on the top plate. Use #6 lockwashers and 6-32 nuts. The wires from the coil bracket assemblies should be placed through their respective holes in the top plate. Place a 1-1/2" length of sleeving over each wire so that when it passes through the hole in the top plate, the insulation will not be cut by the edges of the hole.

Refer to Detail 20C for the following steps.

(✓) Locate the HETERODYNE OSCILLATOR coil mounting bracket (#204-390) and position it as shown in Detail 20C. Also locate coil #40-357, #40-358 and four coils #40-359.

(✓) Install the mounting hardware consisting of three 6-32 x 1/2" round head screws, 1/8" spacers, a small #6 solder lug, #6 lockwashers, and 6-32 nuts at the locations shown.

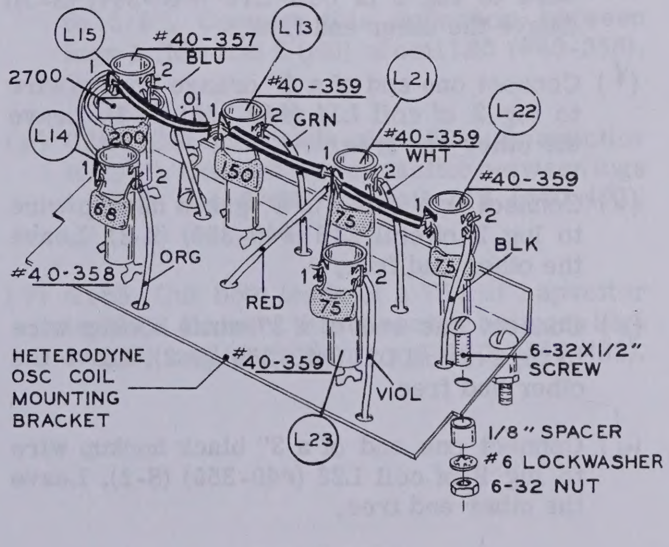
(✓) C102. Cut both leads of a 200 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L15 (#40-357).

(✓) R52. Cut both leads of a 2700 Ω 1/2 watt resistor (red-violet-red) to 3/8". Connect this resistor between lugs 1 (NS) and 2 (NS) of coil L15 (#40-357).

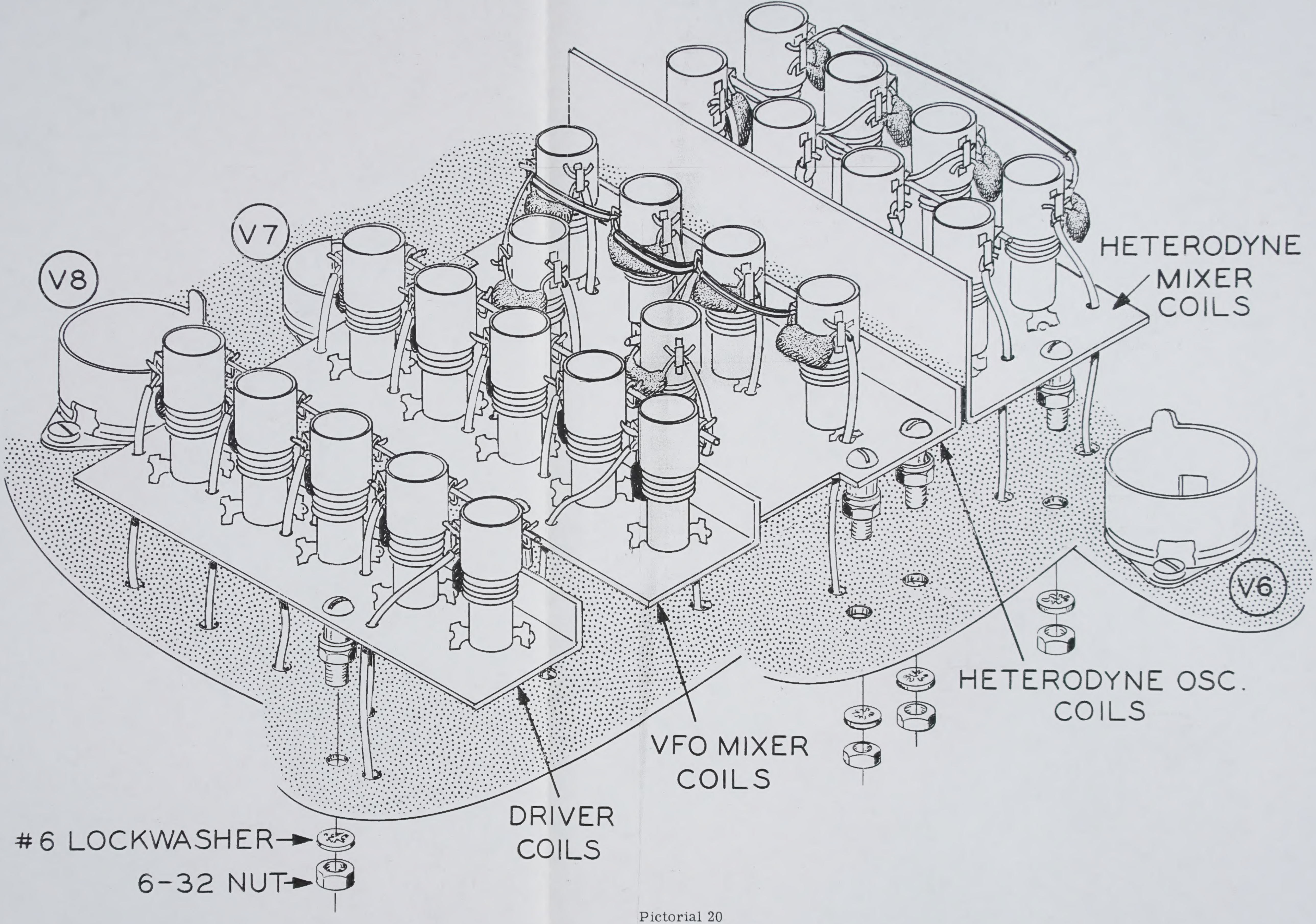
(✓) C101. Cut both leads of a 68 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L14 (#40-358).

(✓) C100. Cut both leads of a 150 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L13 (#40-359).

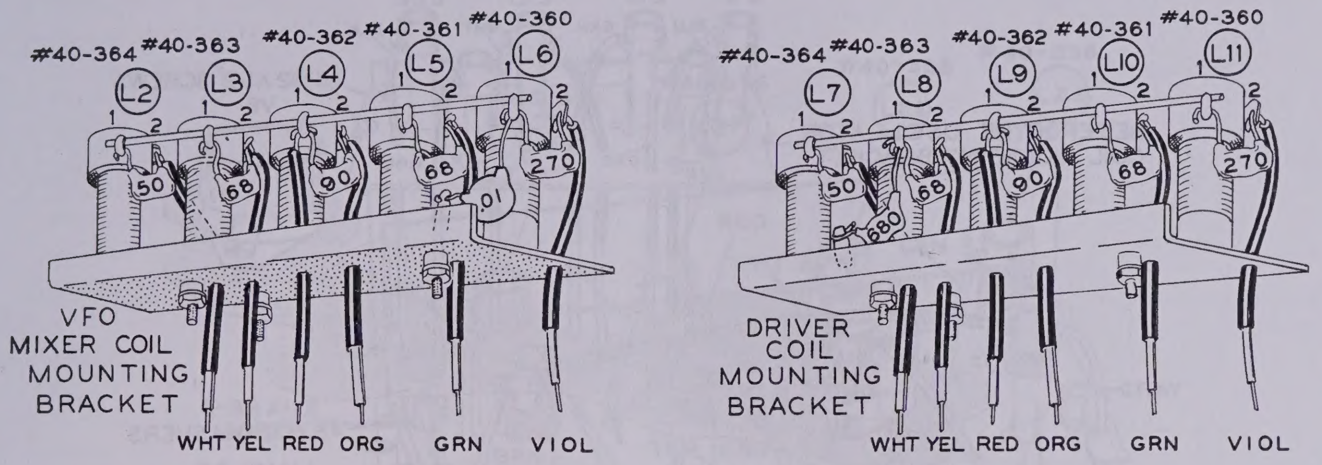
(✓) C99-98-97. Cut both leads of three 75 μμf resin dipped mica capacitors to 3/8". Connect one capacitor between lug 1 (NS) and lug 2 (NS) of each coil, L21, L22, and L23 (#40-359).



Detail 20C



Pictorial 20



NOTE: Place all sleeving on leads after mounting to top plate.

Detail 20B

(✓) Referring to Detail 20A and Pictorial 20, mount the DRIVER and VFO MIXER coil brackets on the top plate. Use #6 lockwashers and 6-32 nuts. The wires from the coil bracket assemblies should be placed through their respective holes in the top plate. Place a 1-1/2" length of sleeving over each wire so that when it passes through the hole in the top plate, the insulation will not be cut by the edges of the hole.

Refer to Detail 20C for the following steps.

(✓) Locate the HETERODYNE OSCILLATOR coil mounting bracket (#204-390) and position it as shown in Detail 20C. Also locate coil #40-357, #40-358 and four coils #40-359.

(✓) Install the mounting hardware consisting of three 6-32 x 1/2" round head screws, 1/8" spacers, a small #6 solder lug, #6 lockwashers, and 6-32 nuts at the locations shown.

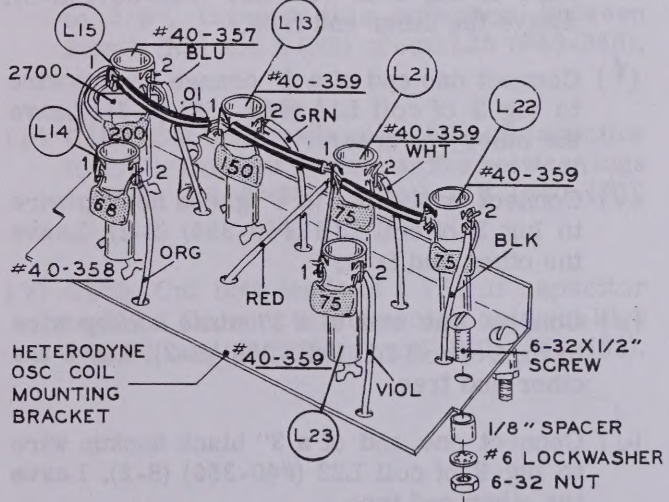
(✓) C102. Cut both leads of a 200 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L15 (#40-357).

(✓) R52. Cut both leads of a 2700 Ω 1/2 watt resistor (red-violet-red) to 3/8". Connect this resistor between lugs 1 (NS) and 2 (NS) of coil L15 (#40-357).

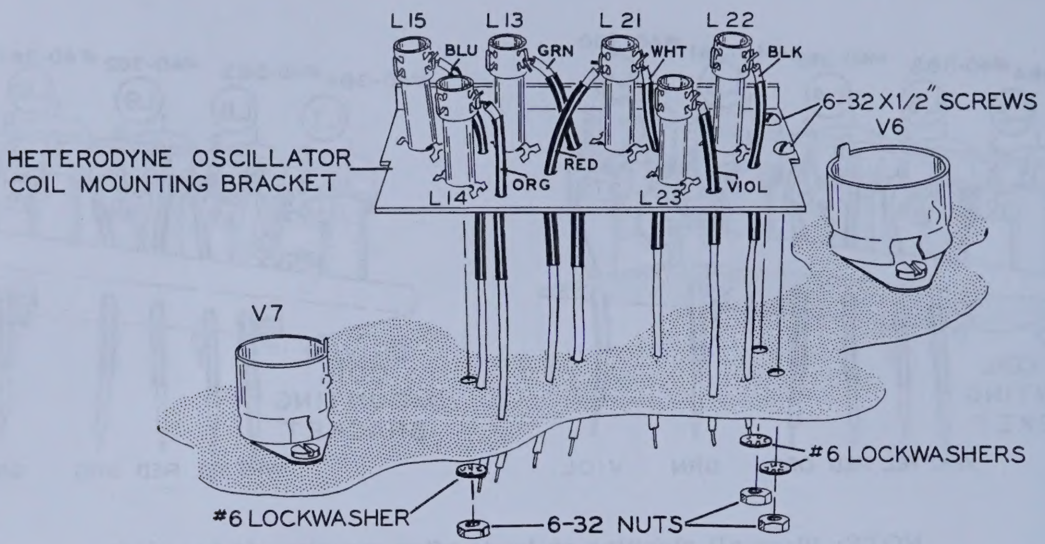
(✓) C101. Cut both leads of a 68 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L14 (#40-358).

(✓) C100. Cut both leads of a 150 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L13 (#40-359).

(✓) C99-98-97. Cut both leads of three 75 μμf resin dipped mica capacitors to 3/8". Connect one capacitor between lug 1 (NS) and lug 2 (NS) of each coil, L21, L22, and L23 (#40-359).



Detail 20C



Detail 20D

(✓) L13, 14, 15, 21, 22, 23. Referring to Details 20C and 20D, mount coils L15, 14, 13, 21, 22, and 23 on this bracket as shown.

(✓) C95. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 1 of coil L13 (NS). Connect the other lead to the adjacent #6 small solder lug (S-1).

NOTE: In each of the following steps, place the free end of the hookup wire through its proper hole in the coil mounting bracket, as shown in Detail 20D.

(✓) Connect one end of a 4-1/4" blue hookup wire to lug 2 of coil L15 (#40-357) (S-3). Leave the other end free.

(✓) Connect one end of a 4" orange hookup wire to lug 2 of coil L14 (#40-358) (S-2). Leave the other end free.

(✓) Connect one end of a 4" green hookup wire to lug 2 of coil L13 (#40-359) (S-2). Leave the other end free.

(✓) Connect one end of a 3" white hookup wire to lug 2 of coil L21 (#40-359) (S-2). Leave the other end free.

(✓) Connect one end of a 3" black hookup wire to lug 2 of coil L22 (#40-359) (S-2). Leave the other end free.

(✓) Connect one end of a 3-1/2" violet hookup wire to lug 2 of coil L23 (#40-359) (S-2). Leave the other end free.

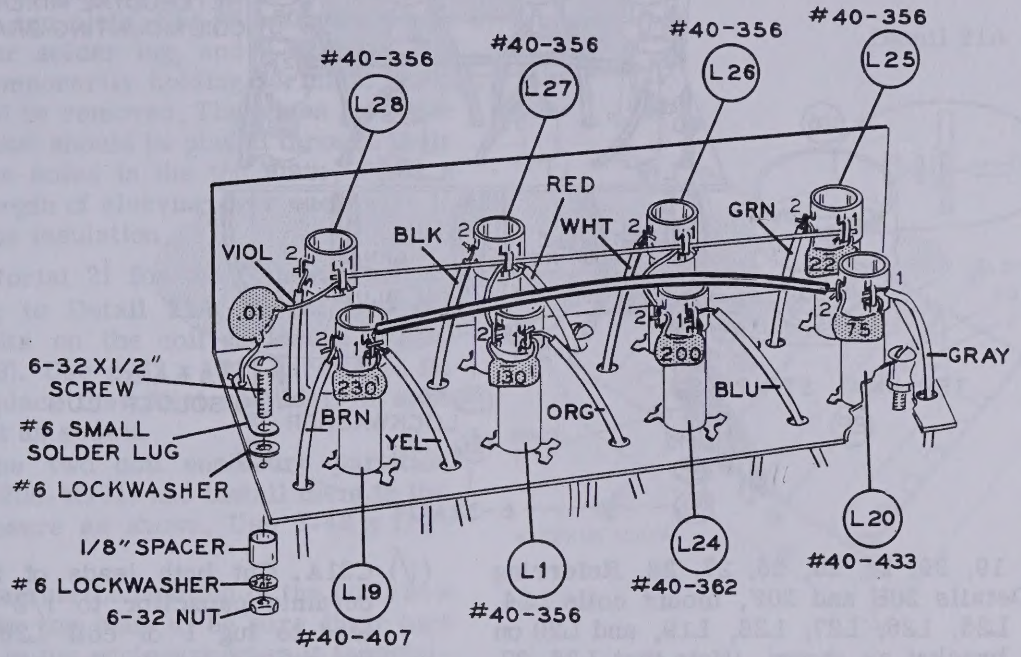
(✓) Connect a length of bare wire between lug 1 of coil L15 (NS) and lug 1 of coil L14 (S-2).

(✓) Connect a length of bare wire between lug 1 of coil L21 (NS) and lug 1 of coil L23 (S-2).

(✓) Pass a length of bare wire through lug 1 of coil L22 (NS), through lug 1 of coil L21 (NS), through lug 1 of coil L13 (NS) (use sleeving on all sections), to lug 1 of coil L15 (NS). Now solder lug 1 of L22 (S-2), lug 1 of L13 (S-4), and lug 1 of L15 (S-4).

(✓) Connect one end of a 5-1/2" red hookup wire to lug 1 of coil L21 (S-5). Leave the other end free.

(✓) Referring to Detail 20D and Pictorial 20, mount the HETERODYNE OSCILLATOR coil bracket on the top plate. Use #6 lockwashers and 6-32 nuts. The wires from this coil bracket should be placed through their respective holes in the top plate. Place a 1-1/2" length of sleeving over each wire to protect the insulation.



HETERODYNE MIXER COIL
MOUNTING BRACKET

Detail 20E

Refer to Detail 20E for the following steps.

(✓) Locate the HETERODYNE MIXER coil mounting bracket (#204-M389) and position it as shown in Detail 20E.

(✓) Install the mounting hardware consisting of three 6-32 x 1/2" round head screws, 1/8" spacers, one #6 small solder lug, #6 lockwashers, and 6-32 nuts at the locations shown.

(✓) Locate coils #40-362, 40-433, 40-407 and five #40-356 coils.

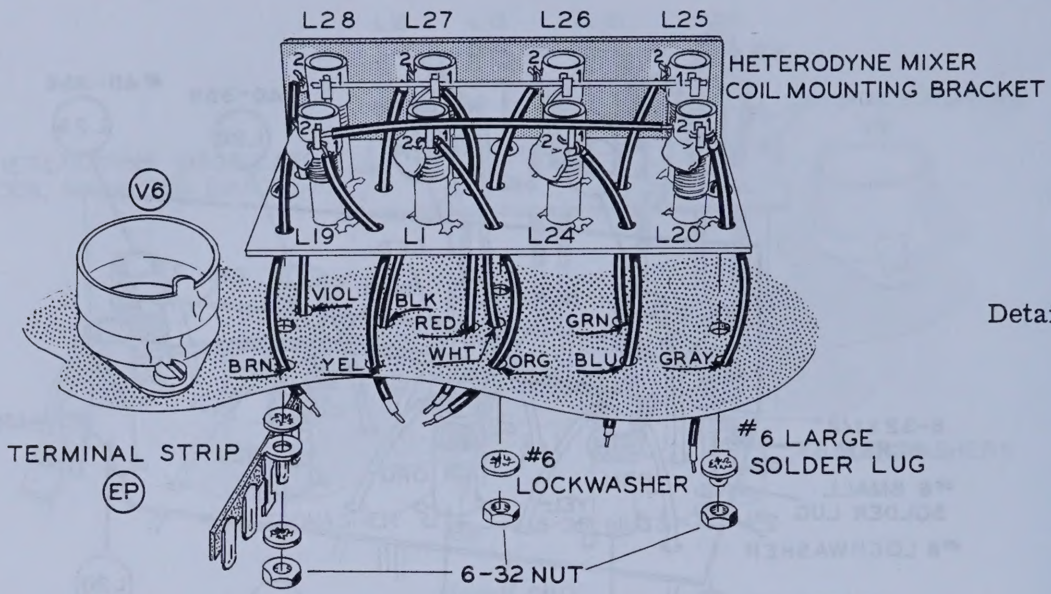
(✓) C33. Cut both leads of a 200 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L24 (#40-362).

(✓) C31. Cut both leads of a 130 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L1 (#40-356).

(✓) C32. Cut both leads of a 22 μμf capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L25 (#40-356).

(✓) C164. Cut both leads of a 230 μμf capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L19 (#40-407).

(✓) C163. Cut both leads of a 75 μμf capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of coil L20 (#40-433).



Detail 20F

(✓) L1, 19, 20, 24, 25, 26, 27, 28. Referring to Details 20E and 20F, mount coils L24, L1, L25, L26, L27, L28, L19, and L20 on this bracket as shown. (Note that L26, 27, and 28 are each #40-356 coils without a capacitor mounted on their lugs.)

NOTE: In the following steps, place the free end of the hookup wire through the proper hole in the coil mounting bracket, as shown in Detail 20F.

(✓) Connect one end of a 4-1/4" blue hookup wire to lug 1 of coil L24 (#40-362) (S-2). Leave the other end free.

(✓) Connect a 4" orange hookup wire to lug 1 of coil L1 (#40-356) (S-2). Leave the other end free.

(✓) Connect one end of a 4-1/4" green hookup wire to lug 2 of coil L25 (#40-356) (S-2). Leave the other end free.

(✓) Connect one end of a 3" white hookup wire to lug 2 of coil L26 (#40-356) (S-1). Leave the other end free.

(✓) Connect one end of a 2-1/2" black hookup wire to lug 2 of coil L27 (#40-356) (S-1). Leave the other end free.

(✓) Connect one end of a 3-1/4" violet hookup wire to lug 2 of coil L28 (#40-356) (S-1). Leave the other end free.

(✓) C31A. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 1 of coil L28 (NS). Connect the other lead to the adjacent #6 small solder lug (S-1).

(✓) Connect one end of a 2-3/4" brown hookup wire to lug 2 of coil L19 (#40-407) (S-2). Leave the other end free.

(✓) Connect one end of a 3-1/2" yellow hookup wire to lug 1 of coil L19 (#40-407) (NS). Leave the other end free.

(✓) Connect one end of a 4" gray hookup wire to lug 1 of coil L20 (#40-433) (S-2). Leave the other end free.

(✓) Connect one end of a 4" red hookup wire to lug 1 of coil L27 (#40-356) (NS). Leave the other end free.

(✓) Pass a length of bare wire through lug 1 (NS) of L28, L27, L26, and L25. Now solder lug 1 of L25 (S-2) and lug 1 of L28 (S-2).

(✓) Connect a length of bare wire from lug 2 of L1 (S-2) to lug 1 of L27 (S-4).

(✓) Connect a length of bare wire from lug 2 of L24 (S-2) to lug 1 of L26 (S-3).

(✓) Connect a length of bare wire from lug 1 of L19 (S-3) to lug 2 of L20 (S-2). Use sleeving on this wire.

(✓) Referring to Detail 20F and Pictorial 20, mount the HETERODYNE MIXER coil bracket on the top plate. Use #6 lockwashers, a #6 regular solder lug, and 6-32 nuts. The screw temporarily holding terminal strip EP should be removed. The wires from the coil bracket should be placed through their respective holes in the top plate. Place a 1-1/2" length of sleeving over each wire to protect the insulation.

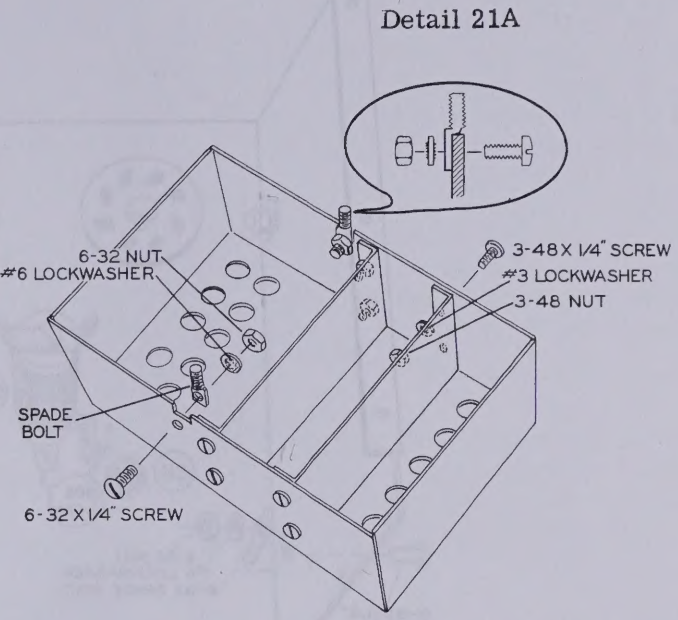
Refer to Pictorial 21 for the following steps.

(✓) Referring to Detail 21A, mount two #6 spade bolts on the coil enclosure (#206-M170F453). Use 6-32 x 1/4" hardware. Be sure to place the offset shoulder of each spade bolt as shown.

(✓) Locate the two coil enclosure partition shields (#206-M171) and install them in the coil enclosure as shown. Use 3-48 x 1/4" hardware.

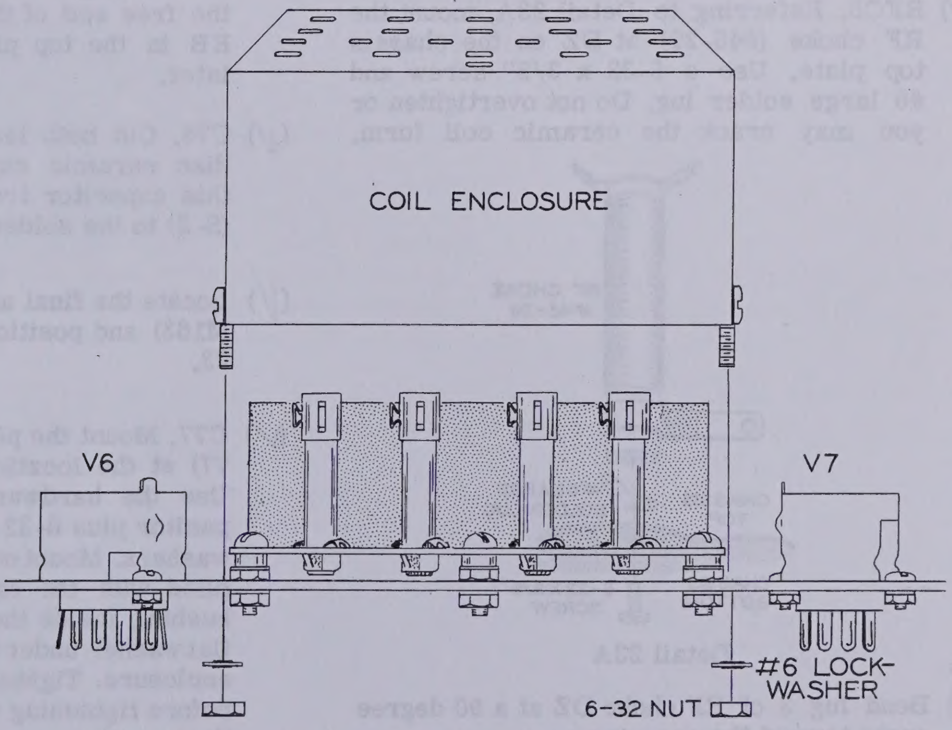
CAUTION: Examine the position of the coils now mounted on the top plate to be sure their lugs will not short to the enclosure when it is installed in the next step. To eliminate the possibility of shorting, you may want to line the inside of the enclosure with masking or electrical tape.

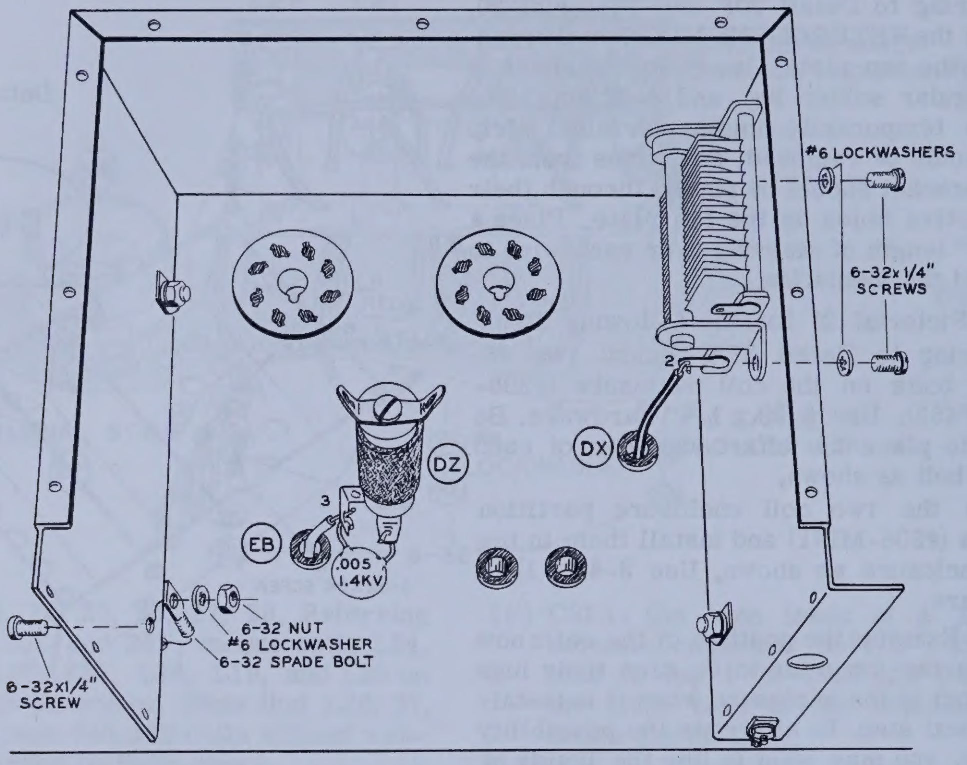
(✓) Referring to Pictorial 22, mount the coil enclosure to the chassis top plate. Use a #6 lockwasher and a 6-32 nut on each spade bolt.



Pictorial 21

Pictorial 22

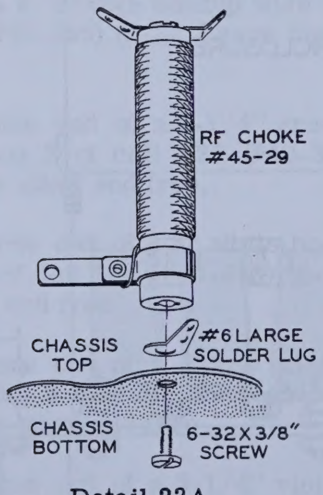




Pictorial 23

Refer to Pictorial 23 for the following steps.

(✓) RFC6. Referring to Detail 23A, mount the RF choke (#45-29) at DZ on the chassis top plate. Use a 6-32 x 3/8" screw and #6 large solder lug. Do not overtighten or you may crack the ceramic coil form.



Detail 23A

(✓) Bend lug 3 of RF choke DZ at a 90 degree angle toward the rear apron.

(✓) Connect one end of a 7-1/2" HV blue hookup wire to lug 3 of RF choke DZ (NS). Place the free end of this wire through grommet EB in the top plate. It will be connected later.

(✓) C75. Cut both leads of a .005 μfd 1.4 kv disc ceramic capacitor to 3/8". Connect this capacitor from lug 3 of RF choke DZ (S-2) to the solder lug secured at DZ (S-1).

(✓) Locate the final amplifier enclosure (#206-M163) and position it as shown in Pictorial 23.

(✓) C77. Mount the plate tuning capacitor (#26-77) at the location shown in Pictorial 23. Use the hardware supplied with the capacitor plus 6-32 x 1/4" screws and #6 lockwashers. Mount one of the flat washers supplied with the capacitor on the capacitor bushing inside the enclosure and the other flat washer under the bushing nut outside the enclosure. Tighten the capacitor bushing nut before tightening the 6-32 x 1/4" screws in the capacitor mounting feet.

Refer to Pictorial 23 for the following steps.

( ) R65. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor between lugs 5 (NS) and 9 (S-2) of switch BJ.

( ) Connect a length of bare wire between lugs [illegible] and 11 (NS) of socket BJ.

( ) Connect a length of bare wire from lug 4 of socket BU (S-1) to lug 3 of crystal socket BB (S-1).

( ) Connect a 1-1/2" yellow hookup wire from lug 1 of crystal socket BB (S-1) to lug 1 of the ceramic trimmer capacitor BA (NS).

( ) C105. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 5 of tube socket BC (S-1) to the solder lug nearest lug 4 of BC (NS).

( ) C103. Cut both leads of a [illegible] silver mica capacitor to [illegible]. Connect this capacitor from lug [illegible] (NS) to the solder lug nearest lug [illegible] (NS).

( ) Connect a length of bare wire from the lug 1 of ceramic trimmer [illegible] (S-1) to the solder lug nearest lug [illegible] of tube socket BC (S-2).

( ) Connect a length of bare wire from the [illegible]

( ) R62. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of tube socket BC (NS) to the solder lug nearest lug 4 of BC (NS).

( ) Connect a 2-1/4" brown hookup wire from lug 4 of tube socket BC (NS) to lug 4 of tube socket BE (NS).

( ) C98. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 2 (NS) of terminal strip BD.

( ) R61. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 6 of tube socket BC (NS) to lug 2 of terminal strip BD (NS).

( ) C102. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor between lugs 3 (S-1) and 4 (NS) of terminal strip BD.

( ) C101. Cut both leads of a .005 μfd disc ceramic capacitor to 3/4". Connect this capacitor from lug 1 of tube socket BE (S-1) to the solder lug nearest lug 4 of BE (NS).

( ) Connect a length of bare wire from the solder lug nearest lug 4 of tube socket BE (S-2) through lug 7 (S-2) to the center post (NS) of tube socket BE.

( ) Bend lug 2 of tube socket BE over to the center post and solder (S-2).

( ) Connect a length of #18 bare wire from lug 1 of the VFO coil BG (S-1) to lug 6 of tube socket BE (NS).

( ) R57. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 1 of tube socket BE (NS) to the solder lug nearest lug 1 of BE (NS).

( ) C110. Cut both leads of a 68 μμfd (NPO) ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (S-2) and 2 (NS) of variable capacitor BF.

( ) Connect a length of #18 bare wire from lug 2 of VFO coil BG (NS) to lug 2 of variable capacitor BF (S-1).

(✓) Mount five 6-32 spade bolts on the final amplifier enclosure. Use 6-32 x 1/4" hardware. Mount the spade bolts on the inside of the enclosure with the offset shoulder facing outward.

(✓) Mount the final amplifier enclosure on the chassis top plate. Position it as shown in Pictorial 23. Use #6 lockwashers and 6-32 nuts on the spade bolts.

( ) Connect one end of a 4" #16 bare wire to lug 2 of the plate tuning capacitor (S-1). Place a 3-1/4" length of sleeving over the free end of this wire and place it through grommet DX in the top plate. It will be connected later.

VFO ENCLOSURE PARTS MOUNTING

Refer to Pictorial 24 for the following steps.

(✓) Locate the VFO subchassis (#200-M288-F449) and position it as shown in Pictorial 24.

(✓) C129. Mount an 8-50 μμf ceramic trimmer capacitor at HA as shown. Use 3-48 x 1/4" hardware. Use care to center the trimmer in its mounting hole.

(✓) Mount the large phenolic crystal socket (#434-38) at HB, using a 4-40 x 1/2" round head machine screw and 4-40 nut. Do not overtighten the screw as it is possible to crack the phenolic.

(✓) Mount a 7-pin shielded ceramic tube socket at HC. Position the blank space as shown by the arrow. Use 3-48 x 1/4" screws, four #3 lockwashers and two #6 small solder lugs, positioned as shown. Place one lockwasher over and one under the solder lug.

(✓) Mount a 5-lug (#3 lug ground) miniature terminal strip at HD. Use 6-32 x 1/4" hardware. Position as shown.

(✓) C124. Mount the 20 μμf variable air trimmer capacitor (#26-24) at HF. Use a #12 lockwasher on the capacitor bushing. Secure above the chassis with the special nut supplied with the capacitor. Position the capacitor as shown. Mark the fully closed position of this capacitor on its shaft and on the chassis top for later adjustment.

(✓) Mount a 7-pin shielded ceramic tube socket at HE. Position the blank space as shown by the arrow. Use 3-48 x 1/4" screws at both mounting holes and mount #6 small solder lugs as shown with #3 lockwashers over and under the lug.

(✓) L18. Mount the VFO oscillator coil (#40-438) at HG. Position terminals 1 and 2 as shown. Secure above the chassis with the lockwasher and nut supplied with the coil. Tighten securely.

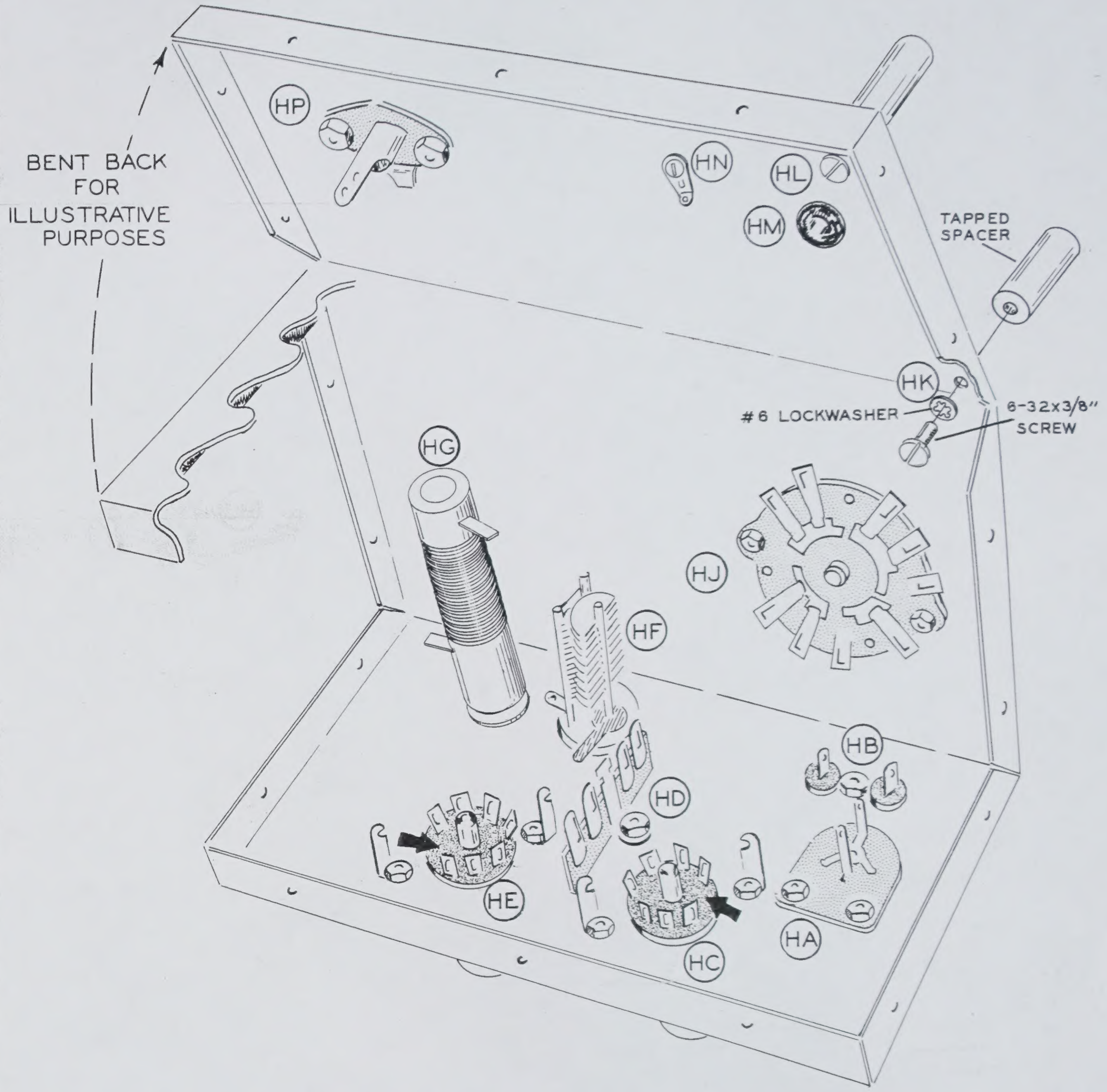
(✓) Mount the CRYSTAL-VFO switch (#63-263) at HJ. Place a 3/8" control lockwasher on the switch bushing, pass the bushing through the mounting hole, and secure on the front of the enclosure with a control flat washer and control nut. Position as shown and tighten securely.

(✓) Insert a 5/16" rubber grommet in hole HM.

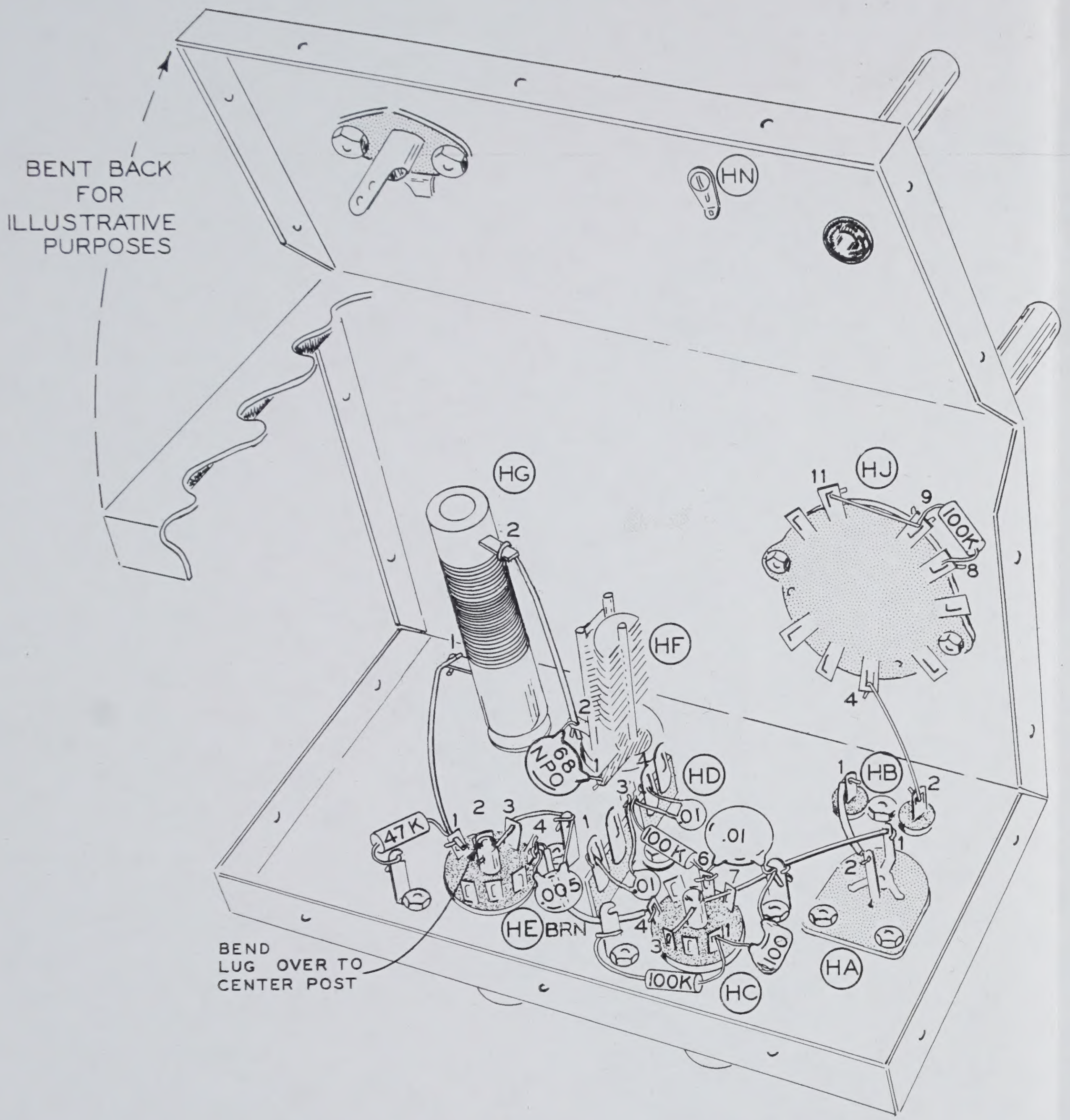
(✓) Mount 7/8" spacers (#255-21) at holes HK and HL. Pass 6-32 x 3/8" screws through #6 lockwashers and then through each hole. Tighten securely.

(✓) Mount a #6 regular solder lug at HN. Use 6-32 x 1/4" hardware.

(✓) Mount a phono connector socket at HP. Position the lugs as shown. Use 6-32 x 1/4" hardware.



Pictorial 24



Pictorial 25

Refer to Pictorial 25 for the following steps.

(✓) R81. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 3/8". Connect this resistor between lugs 8 (NS) and 9 (NS) of switch HJ.

(✓) Connect a length of bare wire between lugs 9 (S-2) and 11 (NS) of switch HJ.

(✓) Connect a length of bare wire from lug 4 of switch HJ (S-1) to lug 2 of crystal socket HB (S-1).

(✓) Connect a 1-1/2" yellow hookup wire from lug 1 of crystal socket HB (S-1) to lug 2 of ceramic trimmer capacitor HA (NS).

(✓) C152. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 6 of tube socket HC (NS) to the solder lug nearest lug 7 of HC (NS).

(✓) C131. Cut both leads of a 100 $\mu\mu$f resin dipped mica capacitor to 3/4". Connect this capacitor from lug 1 of tube socket HC (NS) to the solder lug nearest lug 7 of HC (NS).

(✓) Connect a length of bare wire from lug 1 of ceramic trimmer capacitor HA (S-1) to the solder lug nearest lug 7 of tube socket HC (NS).

(✓) Connect a length of bare wire from the solder lug nearest lug 7 of tube socket HC (S-4) through lug 7 (NS) and the center post (NS) to lug 3 (NS) of HC. Now solder lug 7 of HC (S-2) and the center post (S-2).

(✓) R82. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 1 of tube socket HC (NS) to the solder lug nearest lug 4 of HC (NS).

(✓) Connect a 2-1/4" brown hookup wire from lug 4 of tube socket HC (NS) to lug 4 of tube socket HE (NS).

(✓) C96. Cut both leads of a .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (NS) and 3 (NS) of terminal strip HD.

(✓) R80. Cut both leads of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 1/2". Connect this resistor from lug 6 of tube socket HC (NS) to lug 3 of terminal strip HD (NS).

(✓) C166. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect this capacitor between lugs 3 (S-3) and 4 (NS) of terminal strip HD.

(✓) C127. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 4 of tube socket HE (S-2) to the solder lug nearest lug 4 of HE (NS).

(✓) Connect a length of bare wire from the solder lug nearest lug 4 of tube socket HE (S-2) through lug 3 (S-2) to the center post (NS) of tube socket HE.

(✓) Bend lug 2 of tube socket HE over to the center post and solder (S-2).

(✓) Connect a length of #16 bare wire from lug 1 of the VFO coil HG (S-1) to lug 1 of tube socket HE (NS).

(✓) R77. Cut both leads of a 47 KΩ (yellow-violet-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 1 of tube socket HE (NS) to the solder lug nearest lug 7 of HE (NS).

(✓) C122. Cut both leads of a 68 $\mu\mu$f **NPO** (marked N5) disc ceramic capacitor to 3/8". Connect this capacitor between lugs 1 (S-1) and 2 (NS) of variable capacitor HF.

(✓) Connect a length of #16 bare wire from lug 2 of VFO coil HG (NS) to lug 2 of variable capacitor HF (S-2).

Refer to Pictorial 26 for the following steps.

(✓) C125. Cut both leads of a 1000 μμf resin dipped mica capacitor to 3/8". Connect this capacitor between lugs 7 (NS) and 1 (S-3) of tube socket HE.

(✓) C126. Cut both leads of another 1000 μμf resin dipped mica capacitor to 3/8". Connect this capacitor from lug 7 of tube socket HE (NS) to the solder lug nearest lug 7 of HE (S-2). Position as shown.

(✓) R78. Cut both leads of a 4700 Ω (yellow-violet-red) 1/2 watt resistor to 3/8". Connect this resistor from lug 5 of tube socket HE (NS) to lug 1 of terminal strip HD (NS).

(✓) R79. Cut both leads of a 22 KΩ (red-red-orange) 1/2 watt resistor to 3/8". Connect this resistor from lug 6 of tube socket HE (NS) to lug 1 of terminal strip HD (NS).

(✓) C151. Cut both leads of a .01 μfd disc ceramic capacitor to 3/4". Connect this capacitor from lug 6 of tube socket HE (S-2) to the solder lug nearest lug 4 of tube socket HC (NS).

(✓) C128. Cut both leads of another .01 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 5 of tube socket HE (S-2) to lug 2 of terminal strip HD (NS).

(✓) R83. Cut both leads of a 470 Ω (yellow-violet-brown) 1/2 watt resistor to 3/8". Connect this resistor from lug 2 of tube socket HC (NS) to the solder lug nearest lug 4 of HC (NS).

(✓) C133. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 4 of tube socket HC (NS) to lug 3 of HC (S-2).

(✓) R84. Cut both leads of a 4700 Ω (yellow-violet-red) 1/2 watt resistor to 1/2". Connect this resistor from lug 5 of tube socket HC (NS) to lug 4 of terminal strip HD (NS).

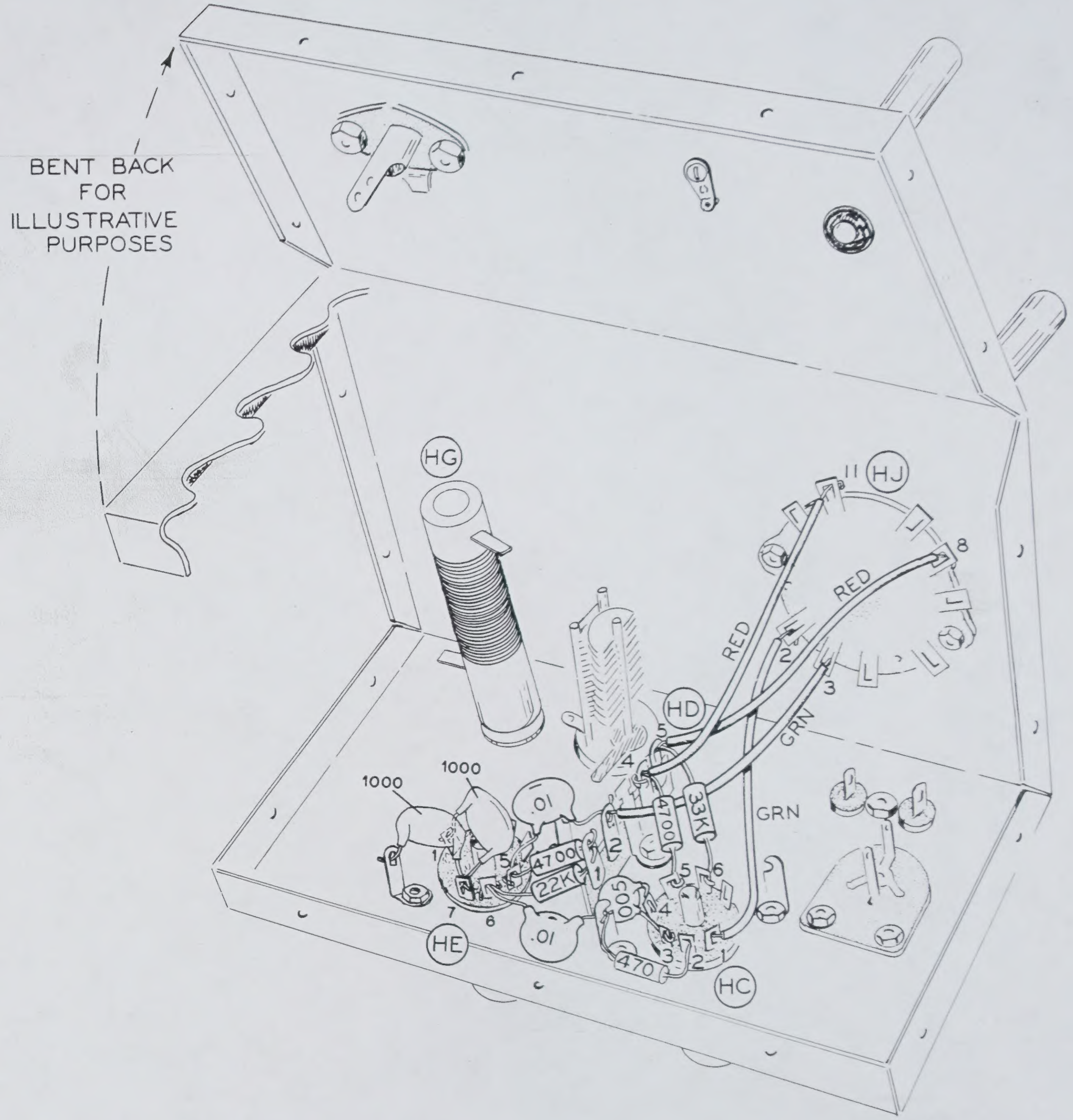
(✓) R85. Cut both leads of a 33 KΩ (orange-orange-orange) 1/2 watt resistor to 3/4". Connect this resistor from lug 6 of tube socket HC (NS) to lug 5 of terminal strip HD (NS).

(✓) Connect a 3" red hookup wire from lug 5 of terminal strip HD (S-2) to lug 8 of switch HJ (S-2).

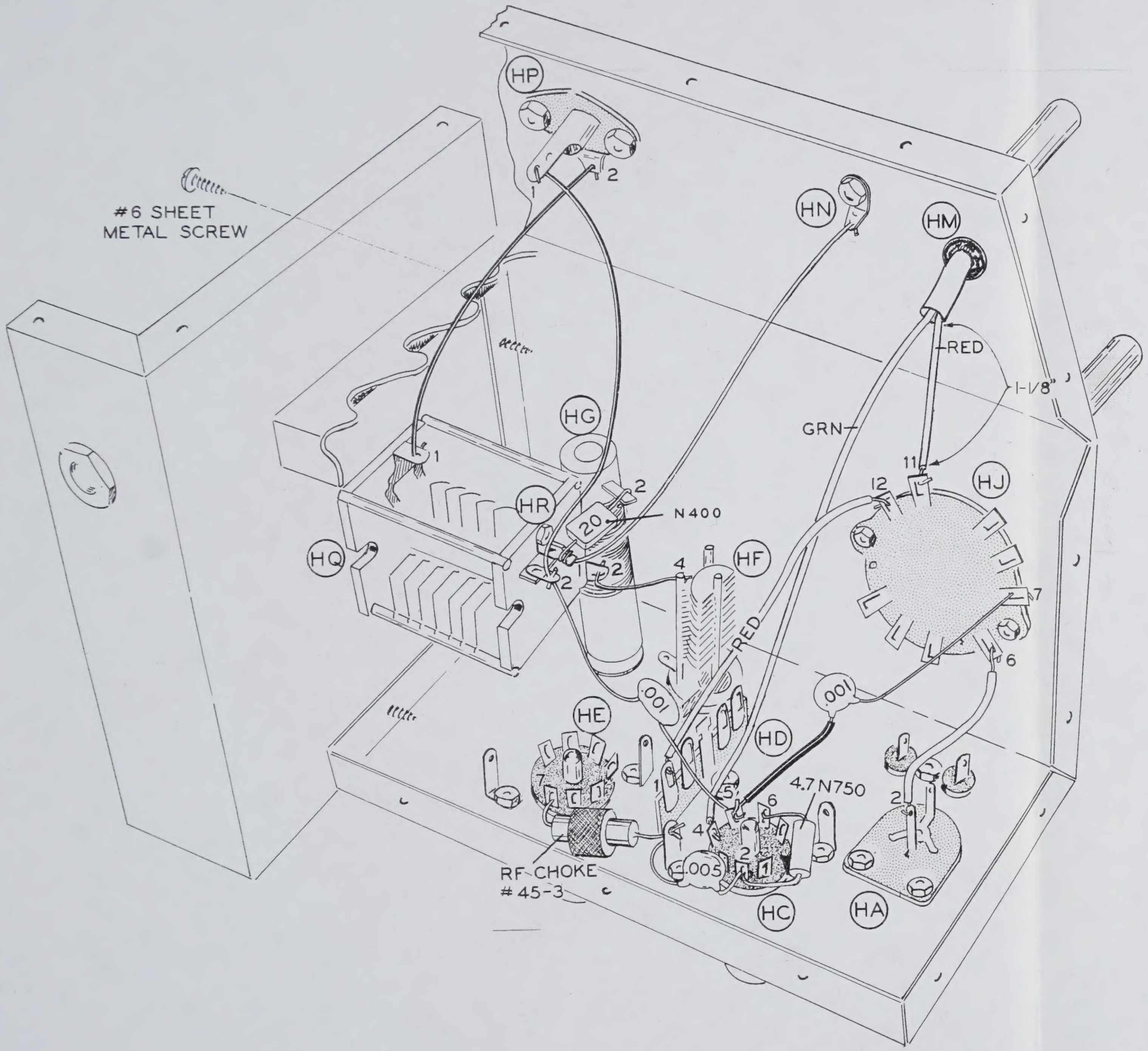
(✓) Connect a 2-1/2" red hookup wire from lug 4 of terminal strip HD (S-3) to lug 11 of switch HJ (NS).

(✓) Connect a 2-3/8" green hookup wire from lug 2 of terminal strip HD (S-2) to lug 3 of switch HJ (S-1).

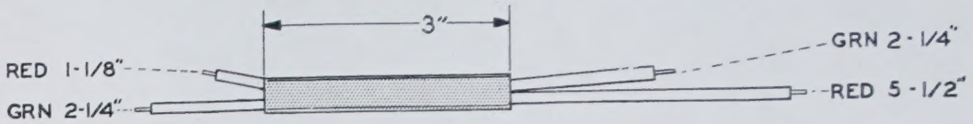
(✓) Connect a 2-1/4" green hookup wire from lug 1 of tube socket HC (S-3) to lug 2 of switch HJ (S-1).



Pictorial 26



Pictorial 27



Detail 27A

Refer to Pictorial 27 for the following steps.

(✓) Connect a 2-3/4" red hookup wire from lug 1 of terminal strip HD (S-4) to lug 12 of switch HJ (S-1).

(✓) Cut both leads of RF choke (#45-3) to 3/4". Connect this choke from lug 7 of tube socket HE (S-3) to the solder lug nearest lug 4 of tube socket HC (NS).

(✓) C132. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect this capacitor from lug 2 of tube socket HC (NS) to the solder lug nearest lug 4 of HC (S-5).

(✓) C159. Cut both leads of a 4.7 μμf tubular ceramic capacitor to 3/8". Connect this capacitor between lugs 2 (S-3) and 6 (S-4) of tube socket HC.

(✓) C130. Cut both leads of a .001 μfd disc ceramic capacitor to 1-1/2". Connect this capacitor from lug 5 of tube socket HC (NS) to lug 7 of switch HJ (S-1). Use sleeving on the lead to lug 5 of HC.

(✓) Connect a 2" yellow hookup wire from lug 2 of trimmer capacitor HA (S-2) to lug 6 of switch HJ (S-1).

(✓) Referring to Detail 27A, place a 7-1/2" length of green and a 9-5/8" length of red hookup wire through a 3" length of clear plastic sleeving.

(✓) Place either end of this prepared cable through grommet HM and connect the red lead to lug 11 of switch HJ (S-3).

(✓) Connect the green lead of this cable to lug 4 of tube socket HC (S-3).

(✓) C123. Locate the 4.6 to 51 μμf variable capacitor (#26-75) and mount it to the VFO front panel as shown in Detail 27B. When mounting this capacitor be sure it is mounted and positioned as shown in the detail. Keep the rotor plates fully meshed to prevent damage.

(✓) Again referring to Detail 27B, mount a 2-lug (#1 lug ground) miniature terminal strip on the variable capacitor. Use 6-32 x 3/8" hardware. Do not overtighten.

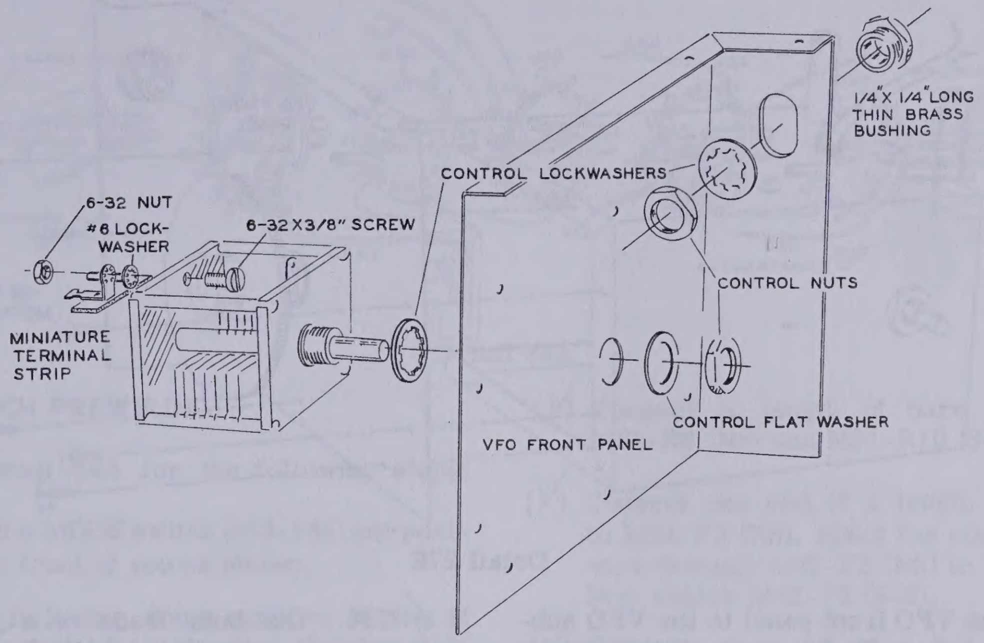
(✓) Install a 1/4" ID x 1/4" long brass bushing on the VFO front panel. Use a control lockwasher and control nut. Position this bushing in the oval hole away from the flanged edge.

Refer to Detail 27C for the following steps.

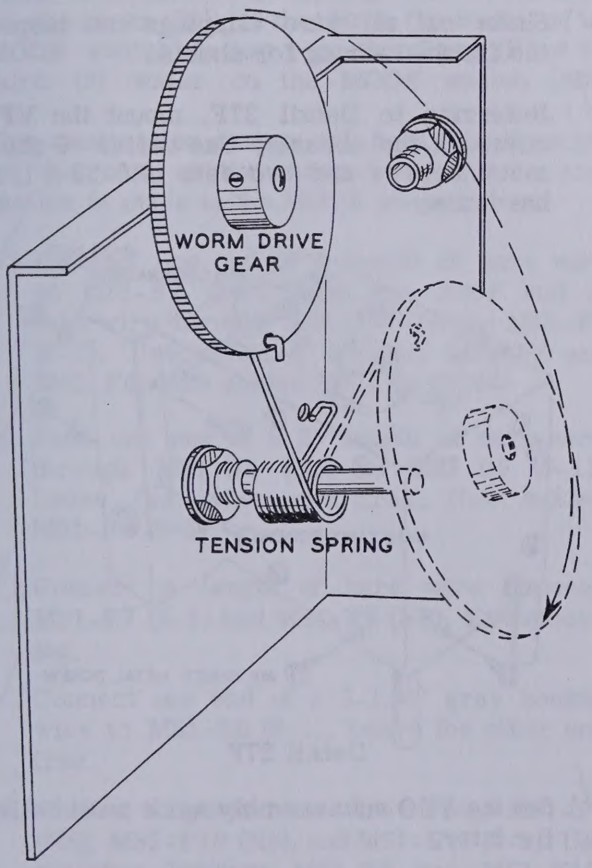
(✓) Locate the phenolic worm drive gear and start an 8-32 x 1/4" Allen head setscrew in the bushing.

(✓) Locate the gear tension spring and place it over the variable capacitor shaft as shown in Detail 27C. Then hook the spring into the VFO front panel and the worm drive gear as shown.

(✓) Rotate the gear as shown and place the phenolic gear on the capacitor shaft. It should be positioned on the shaft so that the end of the capacitor shaft is recessed about 1/16" in the gear bushing.



Detail 27B

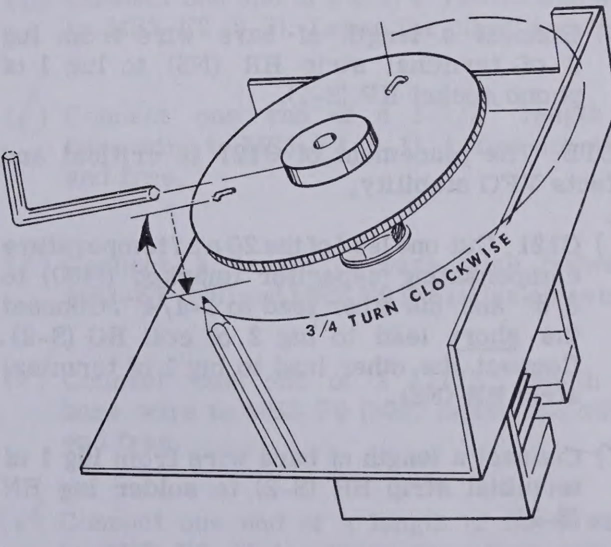


Detail 27C

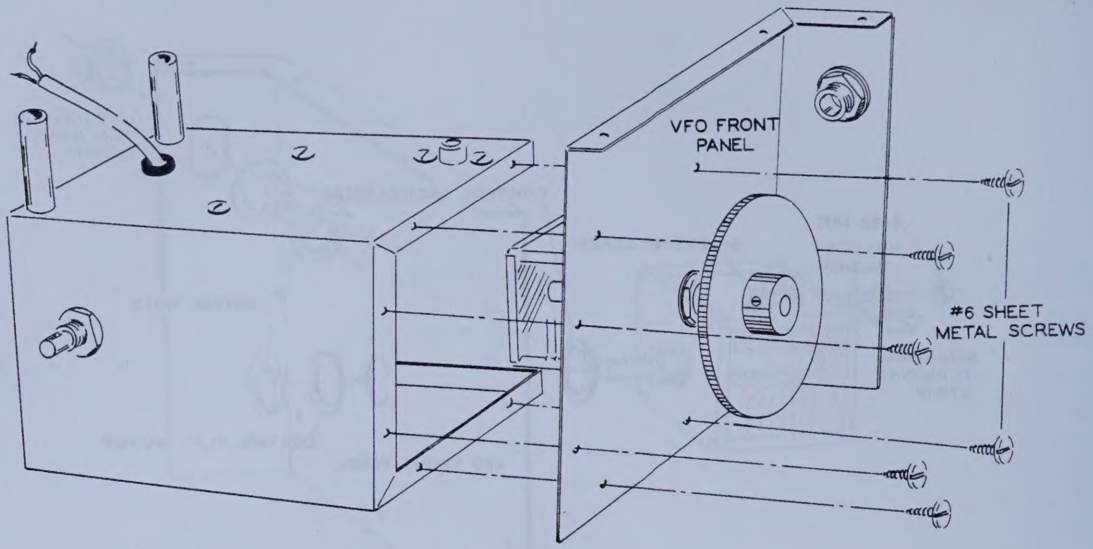
Refer to Detail 27D for the following steps.

(✓) Hold the plates of the variable tuning capacitor closed, rotate the worm drive gear 270 degrees, and tighten the setscrew.

(✓) With the gear held in this position, mark a line on the gear and the VFO front panel to indicate the closed position of the variable capacitor in later steps.



Detail 27D



Detail 27E

(✓) Mount the VFO front panel to the VFO subchassis, using six #6 sheet metal screws as shown in Detail 27E. Be sure to tighten these screws securely.

(✓) Referring to Pictorial 27, connect a length of bare wire from lug 1 of variable capacitor HQ (S-1) to lug 2 of phono socket HP (S-1).

(✓) Connect a length of bare wire from lug 2 of variable capacitor HQ (S-1) to lug 4 of variable capacitor HF (S-1). Use care in soldering to avoid shorting the capacitor plates.

(✓) Connect a length of bare wire from lug 2 of terminal strip HR (NS) to lug 1 of phono socket HP (S-1).

NOTE: The placement of C121 is critical and affects VFO stability.

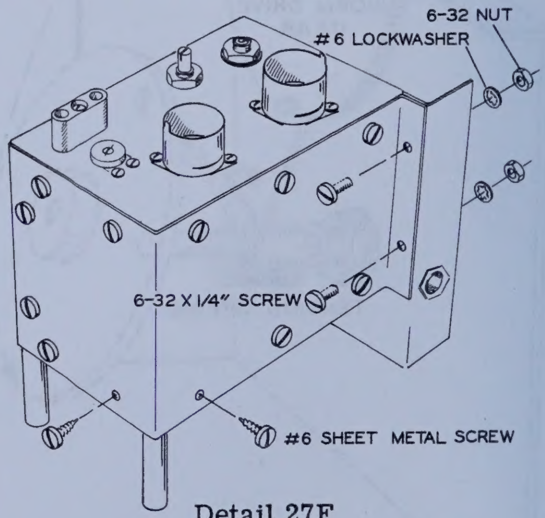
(✓) C121. Cut one lead of the 20 μμf temperature compensating capacitor (marked N400) to 3/8" and the other lead to 1-1/4". Connect the short lead to lug 2 of coil HG (S-2). Connect the other lead to lug 1 of terminal strip HR (NS).

(✓) Connect a length of bare wire from lug 1 of terminal strip HR (S-2) to solder lug HN (S-1).

(✓) C34. Cut both leads of a .001 μfd disc ceramic capacitor to 1". Connect this capacitor from lug 2 of terminal strip HR (S-2) to lug 5 of tube socket HC (S-3).

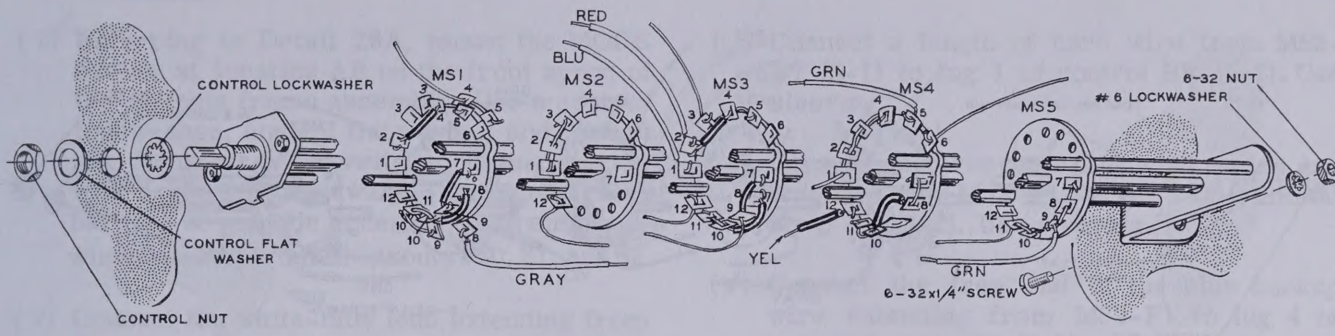
(✓) Shake out all wire clippings and inspect the finished wiring for shorts.

(✓) Referring to Detail 27F, mount the VFO cover on the chassis. Use twelve #6 sheet metal screws and two sets of 6-32 x 1/4" hardware.



Detail 27F

(✓) Set the VFO subassembly aside until called for later.



Detail 28A

MODE SWITCH PREWIRING

Refer to Detail 28A for the following steps.

(✓) Locate the MODE switch (#63-261) and position it in front of you as shown.

NOTE: The following steps concern wiring of the MODE switch. In each step, the direction will read, for example: Connect a 2" hookup wire from MS1-R3 to MS3-F1. This would mean to connect a 2" hookup wire from lug 3 on the rear (R) of the first (1) wafer on the MODE switch to lug 1 on the front (F) of the third (3) wafer on the MODE switch (MS).

This designation system will hold true throughout the rest of the manual whenever a connection is made to the MODE switch.

(✓) Connect one end of a length of bare wire to MS1-F2 (NS). Pass the other end of this wire through MS1-F4 (NS) to MS1-F5 (S-1). Use sleeving between MS1-F2 and MS1-F4. Now solder MS1-F4 (S-2).

(✓) Pass one end of a 2" length of bare wire through MS1-R4 (NS) to MS1-R5 (S-1). Leave the other end free. Now solder MS1-R4 (S-2).

(✓) Connect a length of bare wire between MS1-F7 (S-1) and MS1-F9 (NS). Use sleeving.

(✓) Connect one end of a 3-1/4" gray hookup wire to MS1-R8 (S-1). Leave the other end free.

(✓) Place a length of bare wire through MS1-F8 (NS), MS1-F10 (NS), and MS1-F11 (S-1). Use sleeving between MS1-F8 and MS1-F10. Now solder MS1-F8 (S-1).

(✓) Connect a length of bare wire between MS1-R9 (NS) and MS1-R10 (S-1).

(✓) Connect one end of a length of bare wire to MS2-F3 (NS). Place the other end of this wire through MS2-F2 (NS) to MS2-F1 (S-1). Now solder MS2-F2 (S-2).

(✓) Connect one end of a 1-1/4" length of bare wire to MS2-F12 (S-1). Leave the other end free.

(✓) Connect one end of a 2-1/4" blue hookup wire to MS3-F1 (S-1). Leave the other end free.

(✓) Place a length of bare wire through MS3-F5 (NS), MS3-F4 (NS), and MS3-F2 (NS). Use sleeving between MS3-F2 and MS3-F4. Now solder MS3-F5 (S-1) and MS3-F4 (S-2).

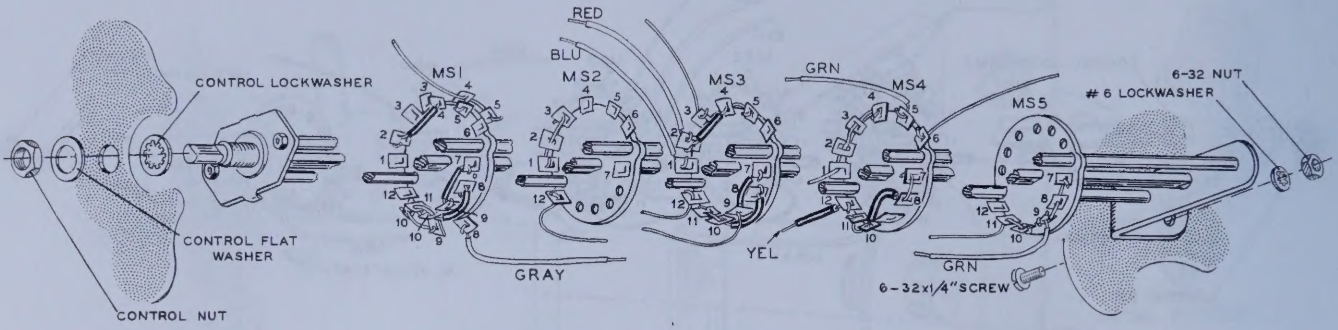
(✓) Connect one end of a 2-1/4" red hookup wire to MS3-F2 (S-2). Leave the other end free.

(✓) Connect one end of a 1-1/2" length of bare wire to MS3-F3 (S-1). Leave the other end free.

(✓) Connect a length of bare wire between MS3-F7 (NS) and MS3-F9 (NS). Use sleeving.

(✓) Connect one end of a 1-1/2" length of bare wire to MS3-F9 (NS). Leave the other end free.

(✓) Connect one end of a length of bare wire to MS3-F8 (S-1). Place the other end of this wire through MS3-F10 (NS) to MS3-



Detail 28A

F11 (NS). Use sleeving between MS3-F8 and MS3-F10. Now solder MS3-F10 (S-2).

(✓) Connect one end of a 1" length of bare wire to MS3-F12 (S-1). Leave the other end free.

(✓) Pass one end of a length of bare wire through MS4-F1, 2, 3 and 4. Leave 3/4" of wire extending from MS4-F1. Now solder MS4-F1, 2, 3 and 4.

(✓) Connect one end of a 2-1/8" green hookup wire to MS4-F5 (S-1). Leave the other end free.

(✓) Connect one end of a 2-1/4" bare wire to MS4-F6 (S-1). Leave the other end free.

(✓) Pass one end of a length of bare wire through MS4-F7, 8, 10 and 11. Use sleeving between MS4-F8 and 10. Now solder MS4-F7, 8 and 11.

(✓) Connect one end of a 1" yellow hookup wire to MS4-F12 (S-1). Leave the other end free.

(✓) Pass one end of a length of bare wire through MS5-F7 (NS), MS5-F8 (NS), to MS5-F9 (NS). Now solder lugs 7 (S-1) and 8 (S-2).

(✓) Connect one end of a 2-1/2" green hookup wire to MS5-F9 (S-2). Leave the other end free.

(✓) Connect a length of bare wire between MS5-F10 (S-1) and MS5-F11 (S-2). Allow 1" of wire to extend beyond MS5-F11.

FINAL WIRING MODE SWITCH

Refer to Pictorial 28 (fold-out from Page 83) for the following steps.

(✓) R116. Place a control solder lug over the control bushing of a 1 megohm audio taper control (#10-122). Form the solder lug so that it lies against lug 3 of the control. Now cut off any excess solder lug.

(✓) Temporarily mount the control and control solder lug on the front apron of the chassis assembly at location AC. Secure the control with a control flat washer and control nut. Position the solder lug as shown.

(✓) Connect the inner conductor of the black shielded cable with the white band extending from Breakout #20 of the harness to lug 1 of control AC (S-1). Connect the shield of this cable to lug 3 of AC (NS).

(✓) Connect the inner conductor of the black shielded cable extending from Breakout #20 of the harness to lug 2 of control AC (S-1). Connect the shield of this cable to lug 3 of AC (S-3).

NOTE: In the following step the MODE switch is mounted. As is evident, space is at a premium here and it is suggested you carefully position the components near the switch wafers so as not to obstruct the mounting. Also important are the switch studs which must remain aligned with the mounting foot. The cable harness at Breakout #30 should be pressed down against the chassis and the wires which will be under the switch stud carefully separated so they are accessible. The harness lacing should now be carefully removed at this breakout to allow the wires to spread out under the switch stud at this point. Use care not to burn adjacent harness wiring in this area.

(✓) Referring to Detail 28A, mount the MODE switch at location AB on the front apron of the chassis frame assembly. Use a control lockwasher, control flat washer, and control nut. Secure the rear switch mounting bracket with 6-32 x 1/4" hardware. Position the cable harness to provide access to the remaining wires coming from Breakouts #30, 31, and 32.

(✓) Connect the white-blue lead extending from Breakout #30 of the harness to MS1-F2 (S-2).

(✓) Connect the free end of the bare wire extending from MS1-R4 to lug 3 of terminal strip BD (S-4). Use sleeving.

(✓) Connect the white-orange-orange lead extending from Breakout #30 of the harness to MS1-R3 (S-1).

(✓) Connect the white-orange lead extending from Breakout #30 of the harness to MS1-F6 (S-1).

(✓) Connect the white-violet lead extending from Breakout #30 to MS1-F12 (S-1). Use care when soldering not to burn adjacent wiring.

(✓) Connect the white-black-black lead extending from Breakout #30 of the harness to MS1-F10 (S-3).

(✓) Connect the white-yellow lead extending from Breakout #30 of the harness to MS1-F9 (S-2).

(✓) Connect the white-blue-blue lead extending from Breakout #30 of the harness to MS1-R9 (S-2).

(✓) Connect the free end of the gray wire extending from MS1-R8 to lug 2 of control BK (S-2).

(✓) Connect the white lead extending from Breakout #32 of the harness to MS2-F3 (S-2).

(✓) Pass a length of bare wire through MS2-F4 (NS) to MS2-F5 (S-1). Connect the other end to lug 1 of terminal strip AF (S-5). Now solder MS2-F4 (S-2).

(✓) Connect the white-black lead from Breakout #32 of the harness to MS2-F6 (S-1).

(✓) Connect a length of bare wire from MS2-F7 (S-1) to lug 1 of control BK (S-2). Use sleeving.

(✓) Connect the free end of the bare wire extending from MS2-F12 to lug 6 of terminal strip BF (S-2). Use sleeving.

(✓) Connect the free end of the blue hookup wire extending from MS3-F1 to lug 4 of terminal strip BO (S-2).

(✓) Connect the free end of the red hookup wire extending from MS3-F2 to lug 10 of terminal strip BF (S-3).

(✓) Connect the free end of the bare wire extending from MS3-F3 to lug 2 of the terminal strip attached to crystal socket BU (NS). Use sleeving.

(✓) Connect the inner conductor of the black shielded cable with the blue band extending from Breakout #22 of the harness to MS3-F6 (S-1). Connect the shield of this cable to MS3-F7 (S-2).

(✓) Connect the free end of the bare wire extending from MS3-F9 to lug 1 of terminal strip BQ (NS).

(✓) Connect the free end of the bare wire extending from MS3-F12 to lug 9 of tube socket BP (S-1).

(✓) Connect the inner conductor of the black shielded cable extending from Breakout #32 of the harness to MS3-F11 (S-2). Connect the shield of this cable to MS3-F9 (S-3).

(✓) Connect the free end of the bare wire extending from MS4-F1 to lug 3 of the terminal strip attached to crystal socket BU (S-4).

(✓) Connect the free end of the green wire extending from MS4-F5 to lug 1 of terminal strip CJ (S-4).

(✓) Connect the free end of the bare wire extending from MS4-F6 to lug 2 of the terminal strip attached to crystal socket BU (S-5).

(✓) Connect the free end of the yellow hookup wire extending from MS4-F12 to lug 2 of crystal socket BU (S-2).

(✓) Connect the free end of the green wire extending from lug 2 of trimmer capacitor BT to MS4-F10 (S-3).

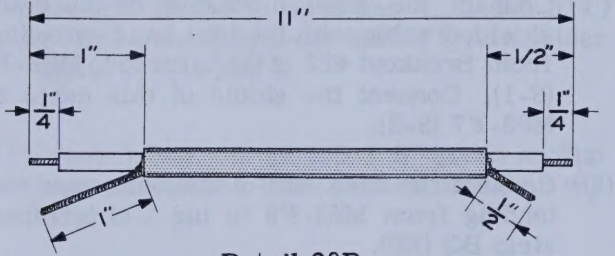
(✓) Connect the free end of the green wire extending from lug 2 of trimmer capacitor BV to MS4-F9 (S-1).

(✓) Connect the bare wire extending from lug 4 of terminal strip CJ to MS5-F12 (S-1).

(✓) Connect the bare wire extending from MS5-F11 to ground lug CH (S-3).

(✓) Locate the crystal filter shield (#206-M166) and install a 5/16" rubber grommet.

(✓) Referring to Detail 28B, prepare an 11" length of RG174-U shielded cable as shown. Use care in tinning the ends not to melt the inner insulation.



Detail 28B

(✓) Place a 1/8" plastic cable clamp over the shielded cable just prepared. See Detail 28C.

(✓) Mount the plastic clamp on the filter shield. Use 6-32 x 3/8" hardware.

(✓) Mount the crystal filter shield on the bottom side of the chassis top plate as shown in Pictorial 28. Use 6-32 x 1/4" hardware. Use care in mounting to prevent shorting of the MODE switch lugs.

(✓) Pass the free end of the green hookup wire extending from MS5-F9 through the rubber grommet and connect it to lug 2 of terminal strip BZ (S-3).

(✓) At the end of the prepared shielded cable with the short ground lead, connect the ground lead to lug 2 of phono socket AR (S-1). Connect the inner conductor to lug 1 of AR (S-1). Connect the inner conductor at the other end of this cable, to lug 2 of tube socket BP (S-4). Connect the shield to lug 1 of terminal strip BQ (S-4).

(✓) RFC11. Cut both leads of a 1.1 mh choke (#45-4) to 3/4". Connect this choke from lug 2 of control BR (S-2) to lug 4 of terminal strip BZ (NS).

(✓) C7. Cut both leads of a 50 μfd tubular electrolytic capacitor to 1". Connect the positive (+) lead of this capacitor to lug 8 of tube socket BP (S-2). Use sleeving.

(✓) Connect the other lead of this capacitor to lug 4 of terminal strip BZ (S-4). Use sleeving.

BAND SWITCH PREWIRING

Refer to Detail 29A for the following steps.

( ) Locate the BAND switch (#63-264) and position it as shown in Detail 29A.

NOTE: The following steps concern the wiring of the BAND switch. In each step, the directions will read, for example: Connect one end of a 2" hookup wire from BS1-F2 to BS5-R2. This would mean to connect one end of a 2" hookup wire from lug 2 on the front of the first (1) wafer of the BAND switch (BS) to lug 2 on the rear (R) of the fifth (5) wafer on the BAND switch (BS). This designation system will hold true throughout the rest of the manual whenever a connection is made to the BAND switch.

(✓) Connect one end of a 2-1/2" length of bare wire to BS1-F3 (S-1). Leave the other end free.

(✓) Connect one end of a 2-3/4" length of bare wire to BS1-F4 (S-1). Leave the other end free.

(✓) Connect one end of a 2-1/2" length of bare wire to BS1-F5 (S-1). Leave the other end free.

(✓) Connect one end of a 2" length of bare wire to BS1-F6 (S-1). Leave the other end free.

(✓) Connect one end of a 1-1/4" length of bare wire to BS1-F7 (S-1). Leave the other end free.

(✓) Connect one end of a 1" length of bare wire to BS1-F8 (S-1). Leave the other end free.

(✓) Connect the free end of the green wire extending from lug 2 of trimmer capacitor BT to MS4-F10 (S-3).

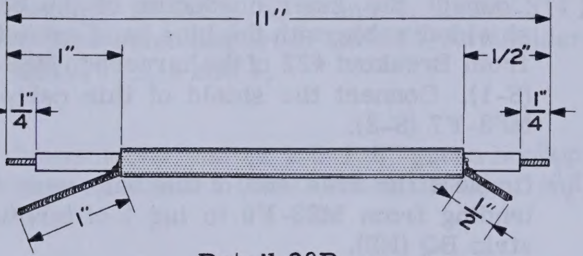
(✓) Connect the free end of the green wire extending from lug 2 of trimmer capacitor BV to MS4-F9 (S-1).

(✓) Connect the bare wire extending from lug 4 of terminal strip CJ to MS5-F12 (S-1).

(✓) Connect the bare wire extending from MS5-F11 to ground lug CH (S-3).

(✓) Locate the crystal filter shield (#206-M166) and install a 5/16" rubber grommet.

(✓) Referring to Detail 28B, prepare an 11" length of RG174-U shielded cable as shown. Use care in tinning the ends not to melt the inner insulation.



Detail 28B

(✓) Place a 1/8" plastic cable clamp over the shielded cable just prepared. See Detail 28C.

(✓) Mount the plastic clamp on the filter shield. Use 6-32 x 3/8" hardware.

(✓) Mount the crystal filter shield on the bottom side of the chassis top plate as shown in Pictorial 28. Use 6-32 x 1/4" hardware. Use care in mounting to prevent shorting of the MODE switch lugs.

(✓) Pass the free end of the green hookup wire extending from MS5-F9 through the rubber grommet and connect it to lug 2 of terminal strip BZ (S-3).

(✓) At the end of the prepared shielded cable with the short ground lead, connect the ground lead to lug 2 of phono socket AR (S-1). Connect the inner conductor to lug 1 of AR (S-1). Connect the inner conductor at the other end of this cable, to lug 2 of tube socket BP (S-4). Connect the shield to lug 1 of terminal strip BQ (S-4).

(✓) RFC11. Cut both leads of a 1.1 mh choke (#45-4) to 3/4". Connect this choke from lug 2 of control BR (S-2) to lug 4 of terminal strip BZ (NS).

(✓) C7. Cut both leads of a 50 μfd tubular electrolytic capacitor to 1". Connect the positive (+) lead of this capacitor to lug 8 of tube socket BP (S-2). Use sleeving.

(✓) Connect the other lead of this capacitor to lug 4 of terminal strip BZ (S-4). Use sleeving.

BAND SWITCH PREWIRING

Refer to Detail 29A for the following steps.

( ) Locate the BAND switch (#63-264) and position it as shown in Detail 29A.

NOTE: The following steps concern the wiring of the BAND switch. In each step, the directions will read, for example: Connect one end of a 2" hookup wire from BS1-F2 to BS5-R2. This would mean to connect one end of a 2" hookup wire from lug 2 on the front of the first (1) wafer of the BAND switch (BS) to lug 2 on the rear (R) of the fifth (5) wafer on the BAND switch (BS). This designation system will hold true throughout the rest of the manual whenever a connection is made to the BAND switch.

(✓) Connect one end of a 2-1/2" length of bare wire to BS1-F3 (S-1). Leave the other end free.

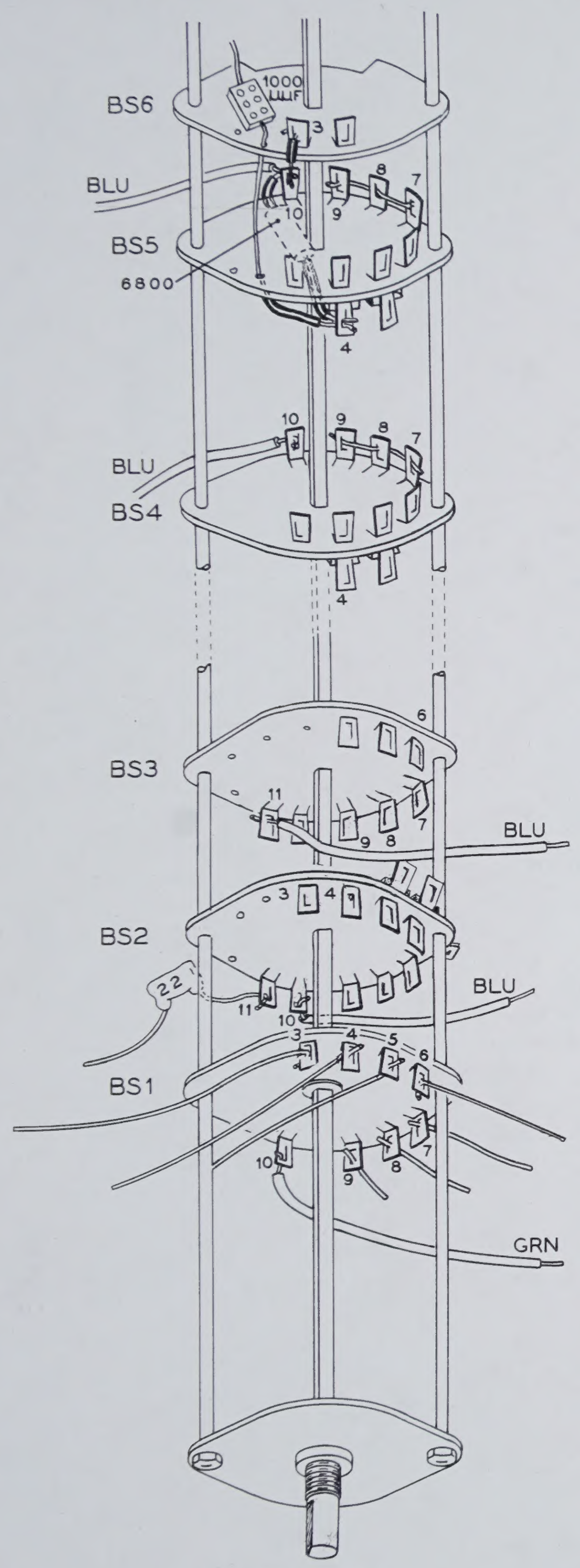
(✓) Connect one end of a 2-3/4" length of bare wire to BS1-F4 (S-1). Leave the other end free.

(✓) Connect one end of a 2-1/2" length of bare wire to BS1-F5 (S-1). Leave the other end free.

(✓) Connect one end of a 2" length of bare wire to BS1-F6 (S-1). Leave the other end free.

(✓) Connect one end of a 1-1/4" length of bare wire to BS1-F7 (S-1). Leave the other end free.

(✓) Connect one end of a 1" length of bare wire to BS1-F8 (S-1). Leave the other end free.



Detail 29A

(✓) Connect one end of a 3/4" length of bare wire to BS1-F9 (S-1). Leave the other end free.

(✓) Connect one end of a 4" green hookup wire to BS1-F10 (S-1). Leave the other end free.

(✓) Connect one end of a 2-3/4" blue hookup wire to BS2-F10 (S-1). Leave the other end free.

(✓) C29. Cut each lead of a 22 µµf resin dipped mica capacitor to 1/2". Connect one lead of this capacitor to BS2-F11 (S-1). Leave the other end free.

(✓) Connect a 3-1/2" blue hookup wire to BS3-F11 (S-1). Leave the other end free.

(✓) Connect one end of a length of bare wire to BS4-R7 (S-1). Pass the free end through BS4-R8 (NS) to BS4-R9 (S-1).

(✓) Connect one end of a 2" blue hookup wire to BS4-R10 (S-1). Leave the other end free.

(✓) C60. Cut one lead of a 1000 µµf (brown-black-red) mica molded capacitor to 1-1/4". Place the uncut lead through the rivet holes for BS6-R2 and BS5-F2 respectively. Connect this lead to BS5-F4 (NS). Leave the other lead free. Use sleeving between BS5-F2 and BS5-F4.

(✓) R36. Cut both leads of a 6800 Ω (blue-gray-red) 1/2 watt resistor to 1". Connect this resistor between BS5-F4 (NS) and BS5-R10 (NS). Use sleeving on both leads. Position to clear the switch rotor.

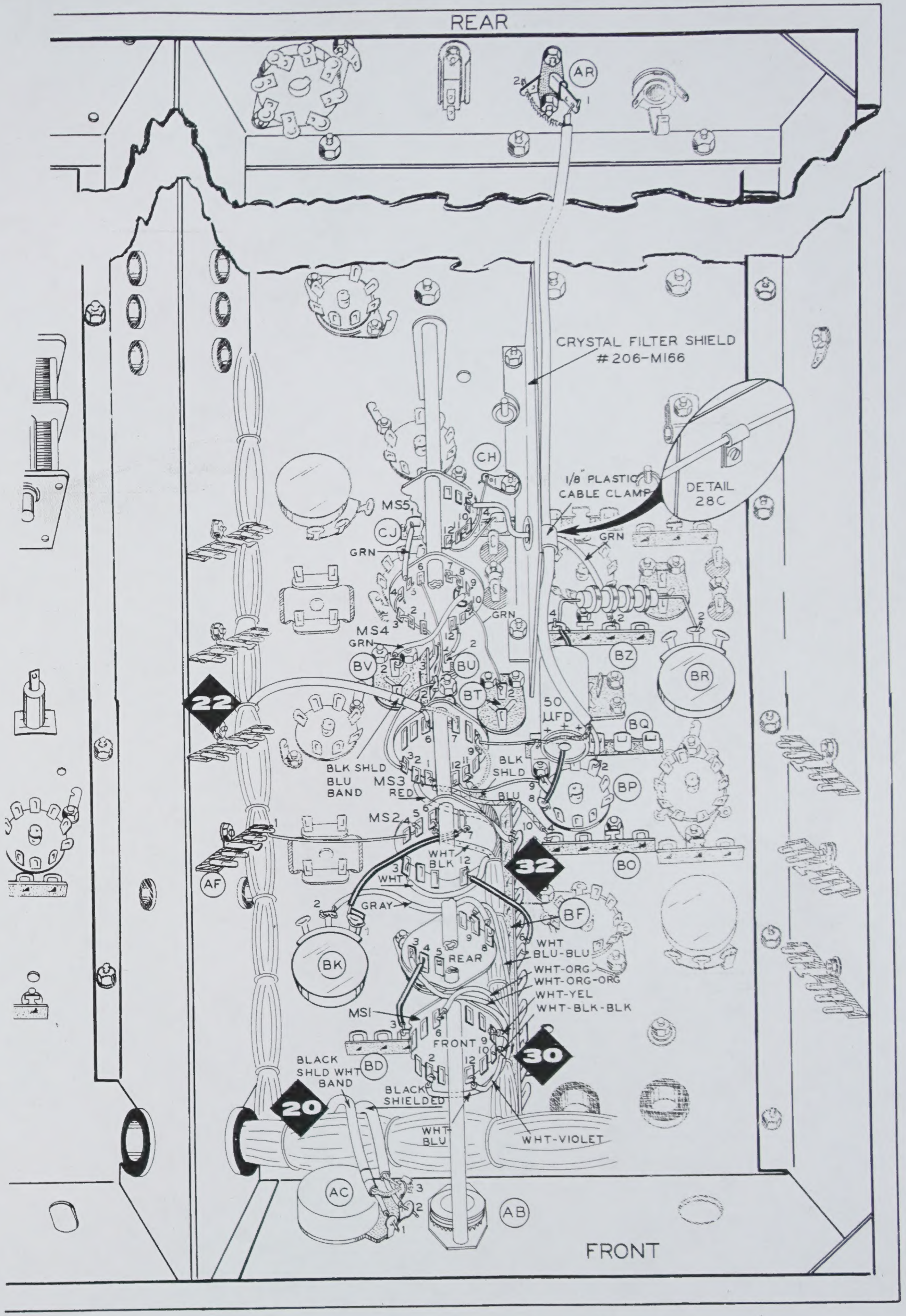
(✓) Connect one end of a length of bare wire to BS5-R7 (NS). Place the free end of this wire through BS5-R8 (NS) to BS5-R9 (S-1). Now solder BS5-R8 (S-2).

(✓) Connect a 2-1/2" blue hookup wire to BS5-R10 (NS). Leave the other end free.

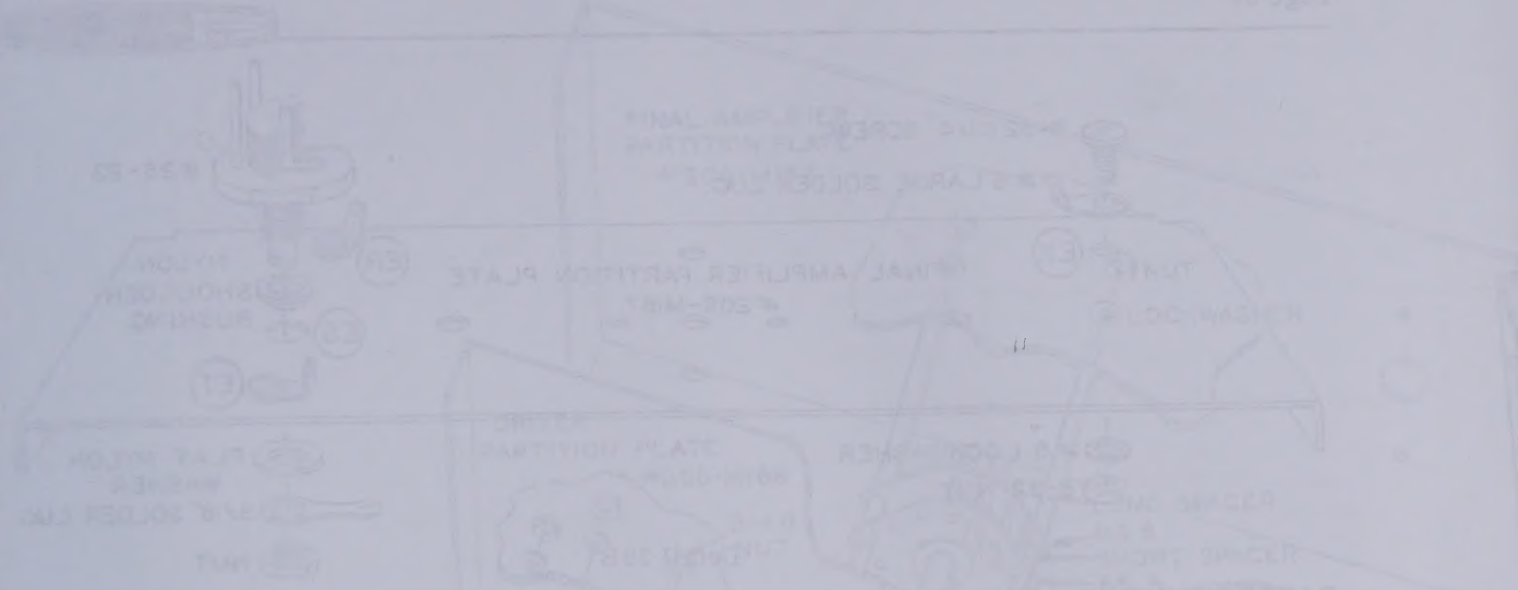
(✓) Connect a 2-1/4" length of bare wire from BS5-R10 (NS) to BS6-R3 (S-1). Use sleeving.

NOTE: Crimp all leads that remain unsoldered to prevent them from coming loose as the switch is moved.

Set the BAND switch aside temporarily.



Pictorial 28



PARTS MOUNTING

FINAL AMPLIFIER PARTITION PLATE

Refer to Detail 29B for the following steps.

(✓) Locate the final amplifier partition plate (#206-M167) and position it as shown.

( ) Mount #6 large solder lugs at locations E2, E7, and EX. Use 6-32 x 1/4" hardware. Position the solder lugs as shown.

(✓) C16. Mount the 9 µµf variable capacitor (#26-22) at location E8. Use a nylon shoulder bushing (#75-18) on the capacitor bushing, a flat nylon washer (#253-40), a 3/8" solder lug, and the nut supplied with the capacitor on the inside of the partition plate as shown in Detail 29B.

BAND SWITCH SUBASSEMBLY

Refer to Pictorial 29 for the following steps.

(✓) Locate the driver partition plate (#206-M168).

(✓) Locate the bias pin socket (#206-M97) and mount it on the driver partition plate as shown. Use 3-48 x 1/4" hardware.

( ) Position the BAND switch as shown in Pictorial 29. Make sure the switch is in its fully counterclockwise position, as viewed from the front. Note that all rotor key mark, openings are in the same position with respect to the shaft.

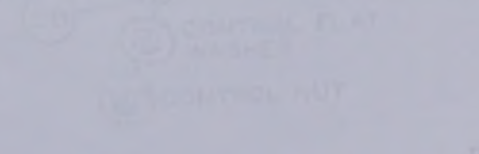
) Remove the nuts and lockwashers securing the rear of the BAND switch. Set them aside as they will be used later.

) Remove the two long end spacers, EE9, the two short spacers, EE8, and the next two medium spacers. Use care so as not to turn the rotor portion of EE9 and EE8.

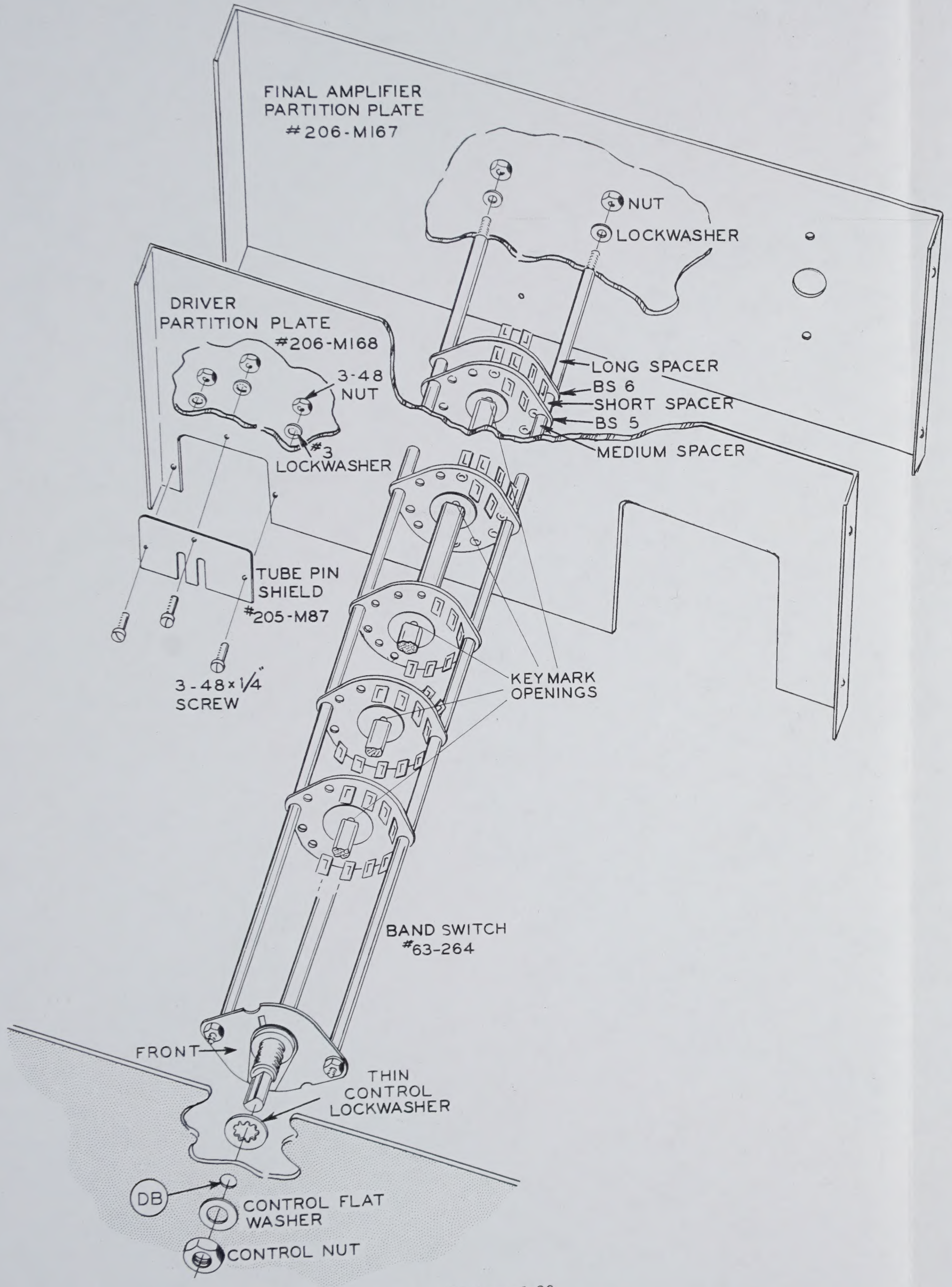
( ) Position the driver partition plate (#206-M168) on the BAND switch studs. Position it as shown in Pictorial 29. Replace the two medium spacers, EE8, the two short spacers, and the two long spacers. Be sure to position the switch wafers and rotors as shown.

) Position the final amplifier partition plate (#206-M167) on the switch studs as shown. Secure with the lockwashers and nuts removed previously.

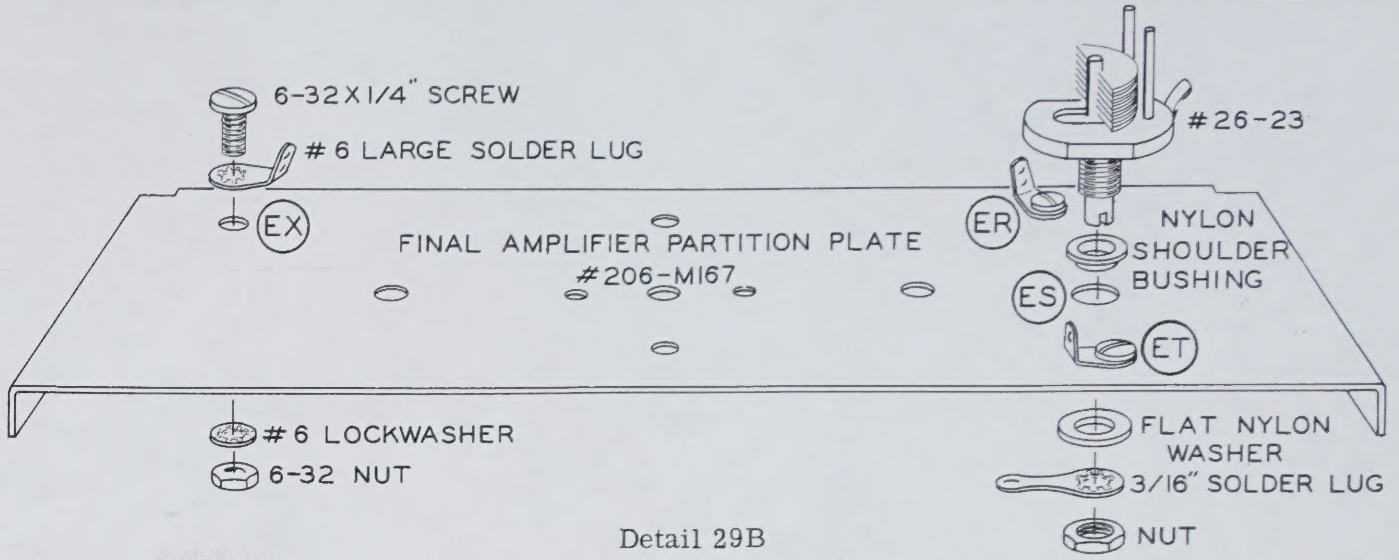
( ) Locate the preassembled wafer for the BAND switch. Position the wafer as shown in Detail 29A. Rotate the rotor of the wafer until the key mark opening is positioned as shown. Note that this opening is positioned opposite those of all the other rotors. Now remove the nuts and lockwashers securing the spacers and mount the wafer. Secure it with the lockwashers and nuts removed previously, mounting a #6 small solder lug at E2 as shown.



Pictorial 29



Pictorial 29



Detail 29B

PARTS MOUNTING

FINAL AMPLIFIER PARTITION PLATE

Refer to Detail 29B for the following steps.

(✓) Locate the final amplifier partition plate (#206-M167) and position it as shown.

(✓) Mount #6 large solder lugs at locations ER, ET, and EX. Use 6-32 x 1/4" hardware. Position the solder lugs as shown.

(✓) C58. Mount the 9 μμf variable capacitor (#26-23) at location ES. Use a nylon shoulder bushing (#75-18) on the capacitor bushing, a flat nylon washer (#253-49), 3/16" solder lug, and the nut supplied with the capacitor on the inside of the partition plate as shown in Detail 29B.

BAND SWITCH SUBASSEMBLY

Refer to Pictorial 29 for the following steps.

(✓) Locate the driver partition plate (#206-M168).

(✓) Locate the tube pin shield (#205-M87) and mount it on the driver partition plate as shown. Use 3-48 x 1/4" hardware.

(✓) Position the BAND switch as shown in Pictorial 29. Make sure the switch is in its fully counterclockwise position, as viewed from the front. Note that all rotor key mark openings are in the same position with respect to the shaft.

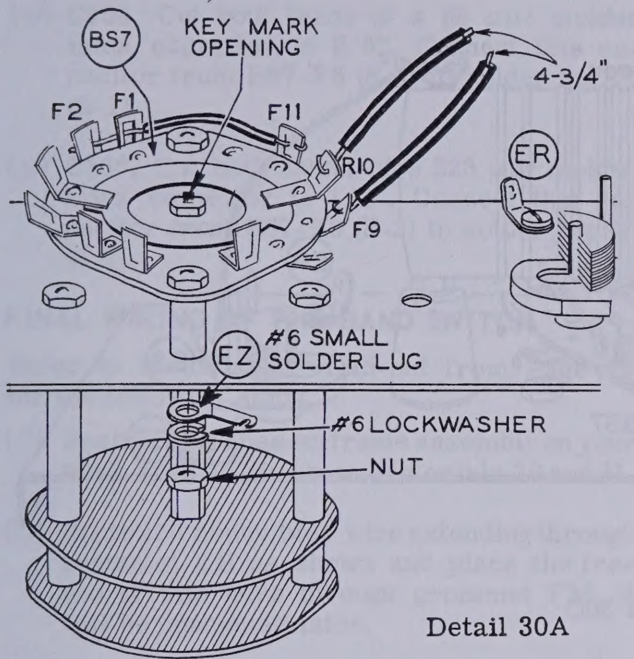
(✓) Remove the nuts and lockwashers securing the rear of the BAND switch. Set them aside as they will be used later.

(✓) Remove the two long end spacers, BS6, the two short spacers, BS5, and the next two medium spacers. Use care so as not to turn the rotor portion of BS5 and BS6.

(✓) Place the driver partition plate (#206-M168) on the BAND switch studs. Position it as shown in Pictorial 29. Replace the two medium spacers, BS5, the two short spacers, BS6, and the two long spacers. Be sure to position the switch wafers and rotors as shown.

(✓) Position the final amplifier partition plate (#206-M167) on the switch studs as shown. Secure with the lockwashers and nuts removed previously.

(✓) Locate the unassembled wafer for the BAND switch. Position the wafer as shown in Detail 30A. Rotate the rotor of the wafer until the key mark opening is positioned as shown. Note that this opening is positioned opposite those of all the other rotors. Now remove the nuts and lockwashers securing the spacers and mount the wafer. Secure it with the lockwashers and nuts removed previously, mounting a #6 small solder lug at EZ as shown.



Detail 30A

WIRING-FINAL AMPLIFIER PARTITION PLATE

Refer to Detail 30A for the following steps.

(✓) Connect one end of a length of bare wire to BS7-F11 (S-1). Pass the free end of this wire through BS7-F1 (NS) to BS7-F2 (NS). Use sleeving between BS7-F11 and BS7-F1. Now solder BS7-F1 (S-2).

(✓) Connect one end of a 4-3/4" length of #16 bare wire to BS7-F9 (NS). Leave the other end free. Place a 4" length of sleeving on this wire.

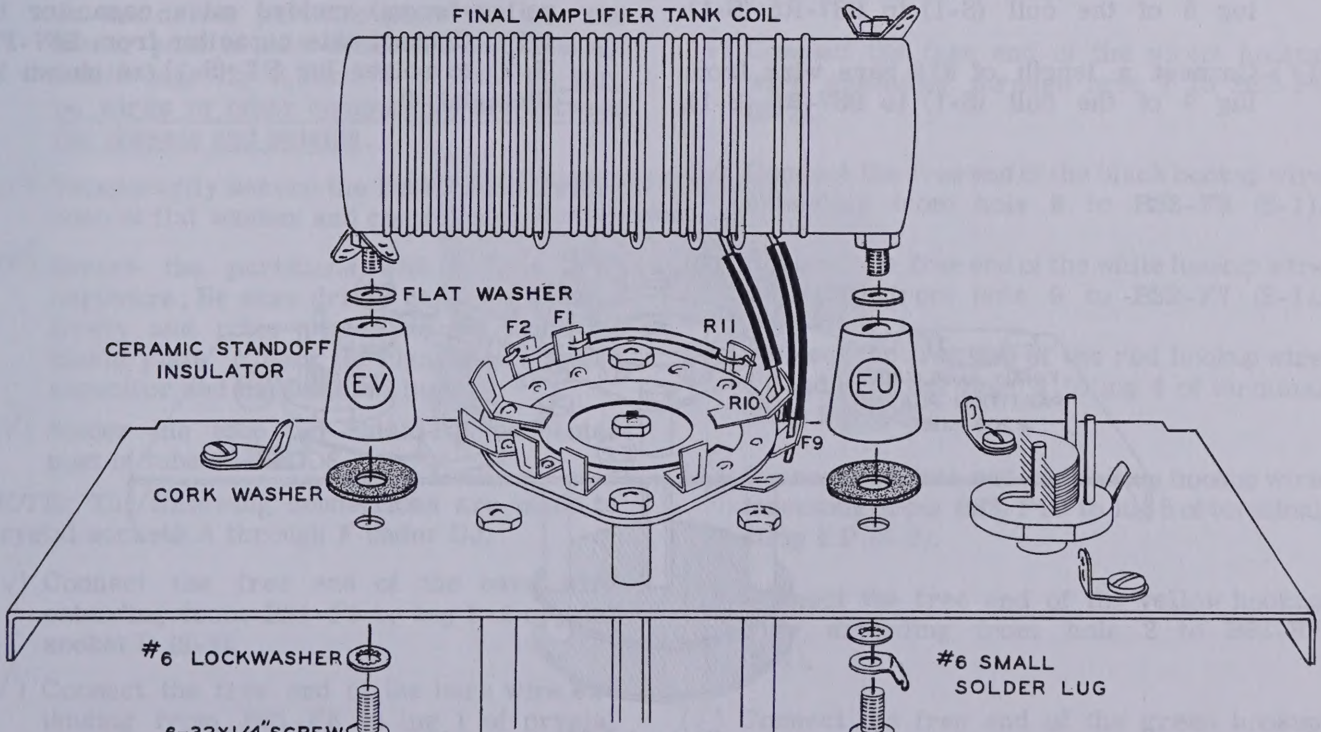
(✓) Connect one end of a 4-3/4" length of #16 bare wire to BS7-R10 (S-1). Leave the other end free. Place a 4" length of sleeving on this wire.

Refer to Detail 30B for the following steps.

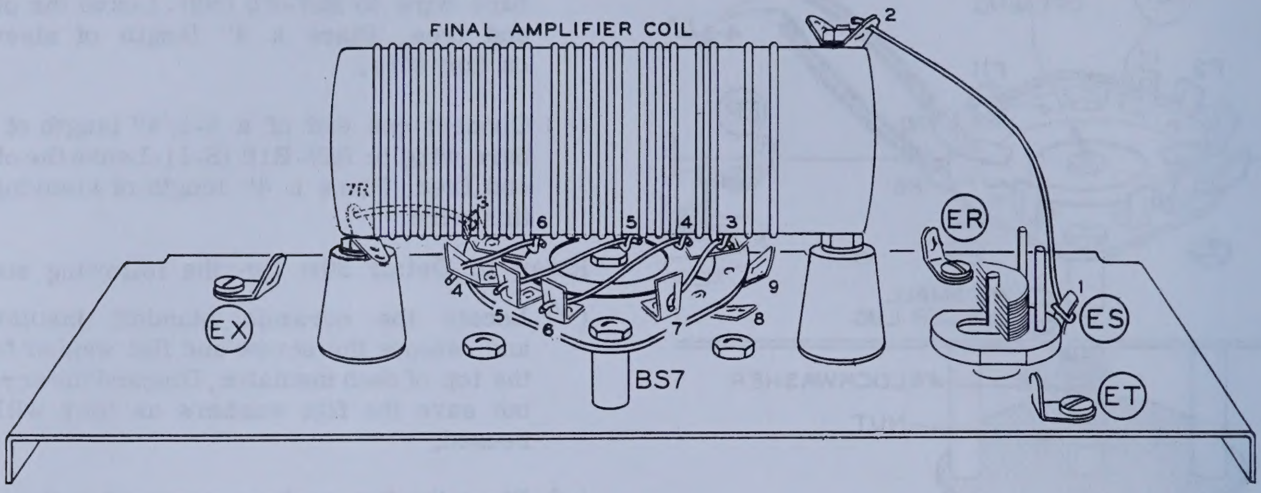
(✓) Locate the ceramic standoff insulators and remove the screw and flat washer from the top of each insulator. Discard the screws but save the flat washers as they will be reused.

(✓) Place the flat washers removed in the preceding step on the mounting studs of the final amplifier tank coil (#40-366). Screw a ceramic standoff insulator on each mounting stud of the coil as shown in Detail 30B.

(✓) Mount the final amplifier coil and the ceramic standoff insulators on the final amplifier partition plate at EU and EV, using the hardware supplied with the insulators and #6 lockwashers. Place a small #6 solder lug under the head of the screw at EU as shown. Be sure to position the coil as shown in Detail 30B.



Detail 30B



Detail 30C

Refer to Detail 30C for the following steps.

(✓) Connect a length of #16 bare wire from lug 1 of variable capacitor ES (NS) to lug 2 of the final amplifier coil (S-1).

(✓) Connect a length of #16 bare wire from lug 6 of the coil (S-1) to BS7-R4 (S-1).

(✓) Connect a length of #16 bare wire from lug 5 of the coil (S-1) to BS7-R5 (S-1).

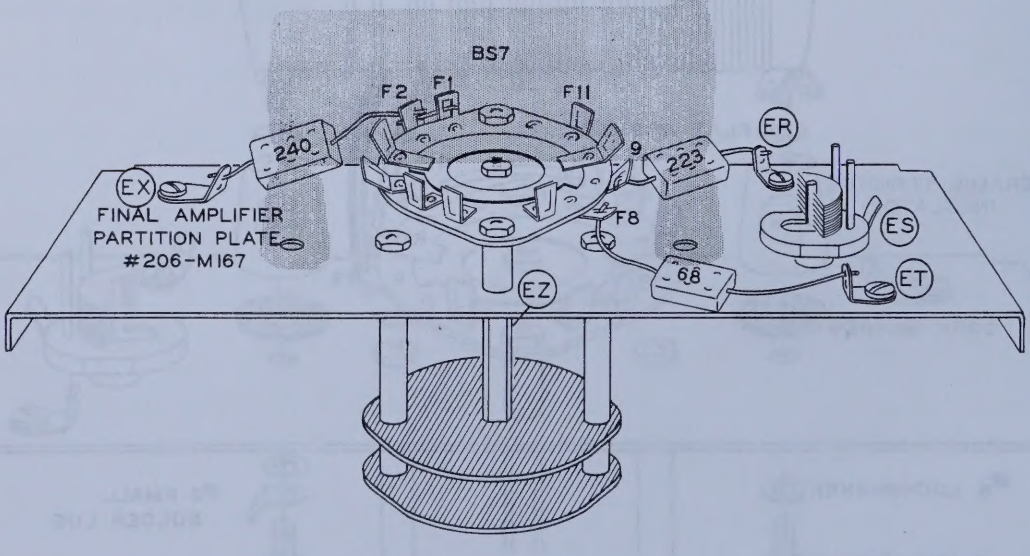
(✓) Connect a length of #16 bare wire from lug 4 of the coil (S-1) to BS7-R6 (S-1).

(✓) Connect a length of #16 bare wire from lug 3 of the coil (S-1) to BS7-R7 (S-1).

(✓) Connect a length of #16 bare wire from lug 7R of the coil (S-1) to BS7-R3 (S-1).

Refer to Pictorial 30 for the following steps.

(✓) C155. Cut both leads of a 240 $\mu\mu$f (red-yellow-brown) molded mica capacitor to 1/2". Connect this capacitor from BS7-F2 (S-2) to solder lug EX (S-1) as shown in Pictorial 30.



Pictorial 30

(✓) C154. Cut both leads of a 68 μμf molded mica capacitor to 3/8". Connect this capacitor from BS7-F8 (S-1) to solder lug ET (S-1).

(✓) C156. Cut both leads of a 223 μμf molded mica capacitor to 1/2". Connect this capacitor from BS7-F9 (S-2) to solder lug ER (S-1).

FINAL WIRING OF THE BAND SWITCH

Refer to Pictorial 31 (fold-out from Page 89) for the following steps.

(✓) Position the chassis frame assembly on your work area as shown in Pictorials 29 and 31.

(✓) Route the heavy blue wire extending through grommet EB as shown and place the free end of this wire through grommet FM. It will be connected later.

(✓) Place a thin control lockwasher on the mounting bushing of the BAND switch assembly and then insert it through location DB on the front apron of the chassis frame assembly and at the same time pass the #16 bare wire from BS7-F9 through grommet DYB and the wire from BS7-R10 through grommet DYA. Now fit the driver and final amplifier partition plates in position, as shown. Be sure that the tube pin shield on the driver partition plate fits into the center post of tube socket DS and does not touch lugs 2, 3, and 8 of DS. Be sure no wires or other components are between the chassis and shields.

(✓) Temporarily secure the BAND switch with a control flat washer and control nut.

(✓) Secure the partitions with 6-32 x 3/8" hardware. Be sure driver capacitor rotates freely and rotor plates do not touch the shield plate. (Check for clearance between capacitor and band switch lugs.)

(✓) Solder the tube pin shield to the center post of tube socket DS.

NOTE: The following connections are made to crystal sockets A through F under DJ.

(✓) Connect the free end of the bare wire extending from BS1-F9 to lug 1 of crystal socket D (S-1).

(✓) Connect the free end of the bare wire extending from BS1-F8 to lug 1 of crystal socket E (S-1).

(✓) Connect the free end of the bare wire extending from BS1-F7 to lug 1 of crystal socket F (S-1).

(✓) Connect the free end of the bare wire extending from BS1-F6 to lug 1 of crystal socket C (S-1). Use sleeving.

(✓) Connect the free end of the bare wire extending from BS1-F5 to lug 1 of crystal socket B (S-1). Use sleeving.

(✓) Connect the free end of the bare wire extending from BS1-F4 to lug 1 of crystal socket A (S-1). Use sleeving.

(✓) Connect the free end of the bare wire extending from BS1-F3 to lug 2 of crystal socket B (S-3). Use sleeving.

(✓) Connect the free end of the green hookup wire extending from BS1-F10 to lug 2 of tube socket DM (S-3).

NOTE: The holes through which the wires from the coil enclosure on top of the chassis are extending are numbered 1 through 29 for reference. Pictorial 31 has been distorted for clarity.

(✓) Connect the free end of the brown hookup wire extending from hole 1 to lug 4 of terminal strip EP (NS).

(✓) Connect the free end of the violet hookup wire extending through hole 7 to BS2-F9 (S-1).

(✓) Connect the free end of the black hookup wire extending from hole 8 to BS2-F8 (S-1).

(✓) Connect the free end of the white hookup wire extending from hole 9 to BS2-F7 (S-1).

(✓) Connect the free end of the red hookup wire extending from hole 3 to lug 4 of terminal strip DL (NS).

(✓) Connect the free end of the blue hookup wire extending from BS2-F10 to lug 5 of terminal strip EP (S-3).

(✓) Connect the free end of the yellow hookup wire extending from hole 2 to BS2-R7 (S-1).

(✓) Connect the free end of the green hookup wire extending from hole 10 to BS2-F6 (S-1).

(✓) Connect the free end of the orange hookup wire extending from hole 4 to BS2-F5 (S-1).

(✓) Connect the free end of the blue hookup wire extending through hole 5 to BS2-F4 (S-1).

(✓) Connect the free lead of the 22 μμf resin dipped mica capacitor extending from BS2-F11 to the solder lug nearest hole 6 (S-1).

(✓) Connect the free end of the gray hookup wire extending through hole 6 to lug 1 of terminal strip DO (NS).

(✓) Connect a 3-1/2" gray hookup wire from BS2-R6 (S-1) to lug 1 of terminal strip DO (S-3).

(✓) Connect a 2-1/4" brown hookup wire from lug 4 of terminal strip EP (S-3) to BS2-R5 (S-1).

(✓) R28. Connect a 2700 Ω (red-violet-red) 2 watt resistor from BS2-F3 (S-1) to lug 4 of terminal strip DL (S-5).

(✓) Connect the free end of the green hookup wire extending through rubber grommet AE in the chassis frame to lug 1 of terminal strip DL (S-2).

(✓) Connect the free end of the violet hookup wire extending from hole 15 to BS3-F9 (S-1).

(✓) Connect the free end of the black hookup wire extending from hole 11 to BS3-F8 (S-1).

(✓) Connect the free end of the white hookup wire extending from hole 12 to BS3-F7 (S-1).

(✓) Connect the free end of the red hookup wire extending from hole 16 to lug 5 of terminal strip DL (S-3).

(✓) Connect the free end of the blue hookup wire extending from BS3-F11 to lug 1 of terminal strip EP (S-2).

(✓) Connect the free end of the green hookup wire extending from hole 13 to BS3-F6 (S-1).

(✓) Connect the free end of the orange hookup wire extending from hole 17 to BS3-F5 (S-1).

(✓) Connect the free end of the blue hookup wire extending from hole 14 to BS3-F4 (S-1).

(✓) Connect the free end of the red hookup wire extending from hole 18 to lug 1 of terminal strip DR (NS).

(✓) Connect the free end of the blue hookup wire extending from BS4-R10 to lug 1 of terminal strip DR (S-5).

(✓) Connect the free end of the white hookup wire extending from hole 23 to BS4-R8 (S-3).

(✓) Connect the free end of the blue hookup wire extending from lug 2 of variable capacitor EQ to BS4-F5 (S-1). Be sure this lug does not touch the capacitor frame or switch lug.

(✓) Connect the free end of the yellow hookup wire extending from hole 19 to BS4-R6 (S-1).

(✓) Connect the free end of the orange hookup wire extending from hole 20 to BS4-R5 (S-1).

(✓) Connect the free end of the blue hookup wire extending from lug 1 of variable capacitor EQ to BS4-F4 (NS).

(✓) Connect the free end of the green hookup wire extending from hole 21 to BS4-R4 (S-1).

(✓) Connect the free end of the violet hookup wire extending from hole 22 to BS4-R3 (S-1).

(✓) Connect the free end of the blue hookup wire extending from lug 5 of tube socket DQ to BS4-F4 (S-2).

(✓) Connect the free end of the white-red harness wire extending through rubber grommet FT to lug 4 of terminal strip DR (S-3).

(✓) Connect the free end of the white-green harness wire extending through grommet FT to lug 2 of terminal strip DR (S-3).

(✓) Connect the free end of the white-brown harness wire extending through rubber grommet FT to lug 4 of tube socket DQ (S-2).

(✓) Connect the free end of the red hookup wire extending from hole 24 to BS5-R10 (S-4). Use care in making this connection not to damage the switch or other components. Dress this lead against the chassis.

(✓) Connect the free end of the blue hookup wire extending from BS5-R10 to lug 4 of terminal strip DT (NS). Dress this lead flat against the chassis.

(✓) Connect the free end of the white hookup wire extending from hole 29 to BS5-R7 (S-2).

(✓) Connect the free end of the yellow hookup wire extending from hole 25 to BS5-R6 (S-1).

(✓) Connect the free end of the orange hookup wire extending from hole 26 to BS5-R5 (S-1).

(✓) Connect the free end of the blue hookup wire from lug 4 of variable capacitor EQ to BS5-F5 (S-1).

(✓) Connect the free end of the green hookup wire extending from hole 27 to BS5-R4 (S-1).

(✓) Connect the free end of the blue hookup wire from lug 3 of variable capacitor EQ to BS5-F4 (NS).

(✓) Connect the free end of the violet hookup wire extending from hole 28 to BS5-R3 (S-1).

(✓) Connect the free end of the blue hookup wire extending from lug 6 of tube socket DS to BS5-F4 (S-4).

(✓) Connect the free end of the white-red wire extending through grommet FR to lug 1 of terminal strip DT (S-4).

(✓) Connect the free lead of the 1000 $\mu\mu$f mica molded capacitor from BS5-F4 to the bare wire connected between lug 5 of tube socket DV and lug 5 of tube socket DW (S-1).

(✓) C57. Cut both leads of a 2000 $\mu\mu$f (red-black-red) molded mica capacitor to 1/2". Connect one lead of this capacitor to BS6-R4 (S-1). Solder the other lead of this capacitor to solder lug EZ as shown (S-1).

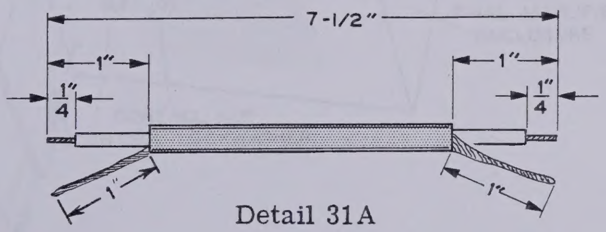
(✓) Connect the free end of the heavy black wire extending through grommet FP to lug 7 of tube socket DW (S-4).

(✓) Connect the free end of the white-green harness wire extending through grommet AL to lug 5 of terminal strip DU (S-3).

(✓) Connect the free end of the white-brown harness wire extending through grommet AN to lug 1 of terminal strip DU (S-3).

(✓) Connect the free end of the blue hookup wire extending through grommet AM to lug 2 of terminal strip DU (S-3).

(✓) Referring to Detail 31A, prepare an 8-1/2" length of RG-174-U shielded cable. Use care in tinning the leads. Position as shown. At one end of the prepared cable connect the inner conductor to the solder lug on variable capacitor ES (S-1). Connect the ground lead to the solder lug at EU (S-1). This lead must be routed exactly as shown.



Detail 31A

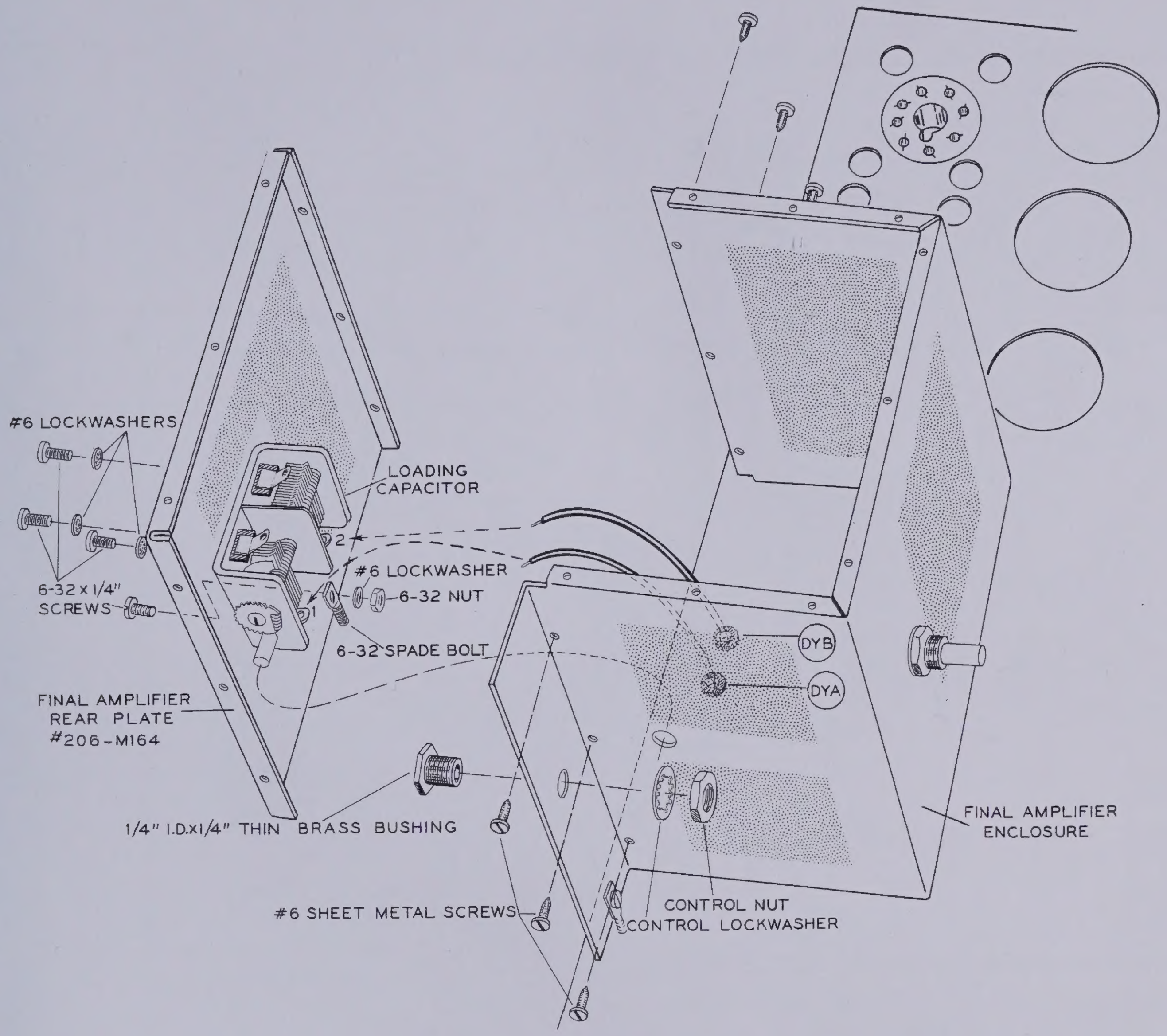
(✓) At the other end of this cable, connect the inner conductor to lug 4 (S-3) and the shield to lug 2 (S-2) of terminal strip DT. Route as shown.

(✓) Connect the #16 bare wire extending through grommet DX to lug 1 of variable capacitor ES (S-2).

( ) Connect a length of #16 bare wire from lug 4 of terminal strip DC (S-2) to lug 7F of the final amplifier coil (NS).

(✓) Connect a length of #16 bare wire from lug 7F of final amplifier coil (S-2) to lug 1 of capacitor DD (S-2).

(✓) Connect the white-red-red wire extending through grommet FM to lug 1 of terminal strip DC (S-3).



Pictorial 32

Refer to Pictorial 32 for the following steps.

(✓) Locate the final amplifier rear plate (#206-M164).

(✓) Mount a 6-32 spade bolt on the bottom of the rear plate as shown. Use 6-32 x 1/4" hardware. Set this plate aside temporarily.

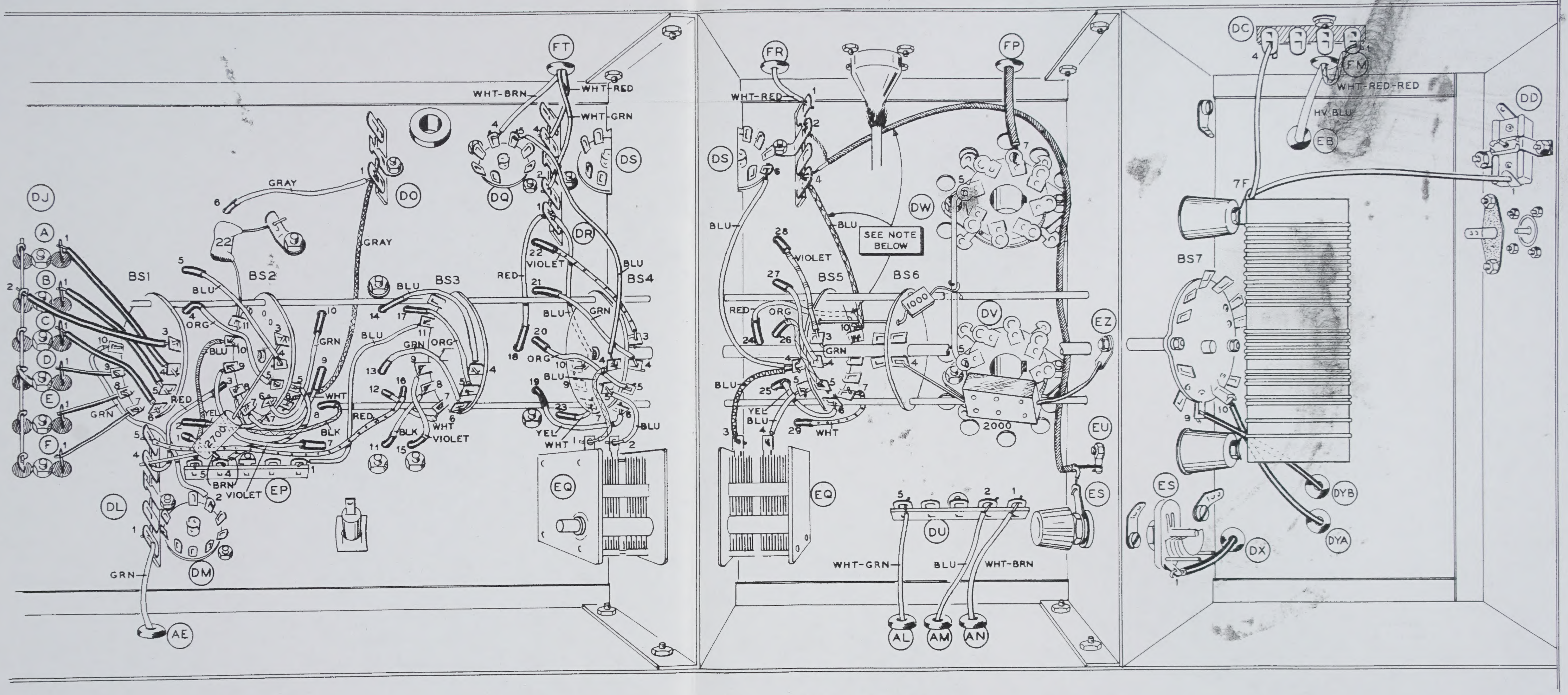
(✓) C78. Locate the 2-section loading capacitor (#26-80) and while holding the shaft through its mounting hole, connect the free end of the #16 bare wire extending from DYA to lug 1 of the loading capacitor (S-1).

(✓) Connect the free end of the #16 bare wire extending from DYB to lug 2 of the loading capacitor (S-1).

(✓) Position the final amplifier rear plate on the final amplifier enclosure.

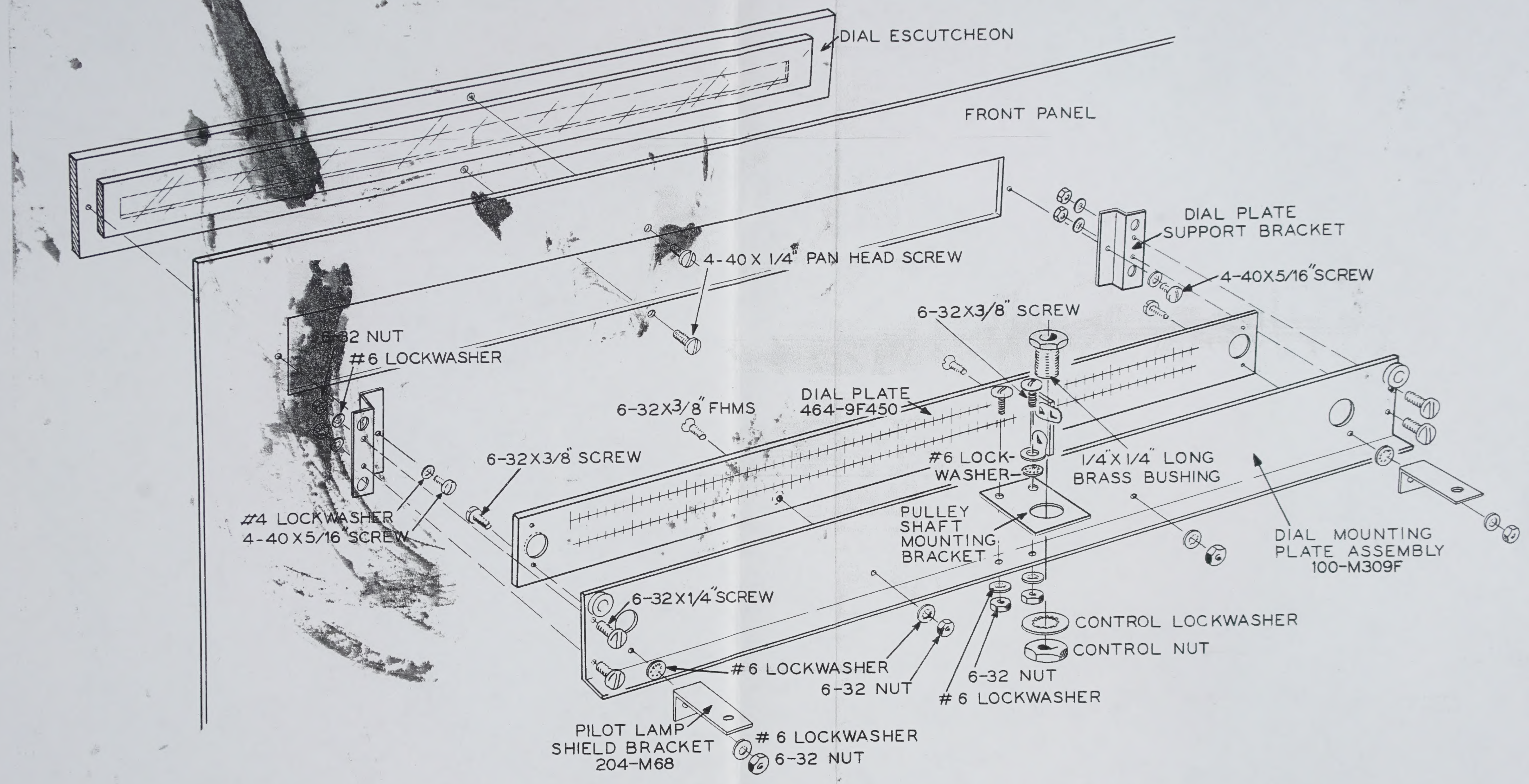
( ) C78. Mount the 2-section loading capacitor on the rear plate at the location shown in Pictorial 32. Use three 6-32 x 1/4" screws and #6 lockwashers.

( ) Secure the two sides of the rear plate with six #6 sheet metal screws and use a #6 lockwasher and 6-32 nut on the spade bolt under the chassis.



NOTE: FOR PROPER NEUTRALIZATION AND GRID DRIVE THESE LEADS MUST BE ROUTED AS SHOWN AND PLACED FLAT AGAINST THE CHASSIS.

Pictorial 31


DIAL ESCUTCHEON
FRONT PANEL
DIAL PLATE SUPPORT BRACKET
4-40 X 1/4" PAN HEAD SCREW
4-40X5/16" SCREW
6-32X3/8" SCREW
6-32 NUT
#6 LOCKWASHER
DIAL PLATE 464-9F450
6-32X3/8" FHMS
6-32X3/8" SCREW
#6 LOCK-WASHER
1/4"X1/4" LONG BRASS BUSHING
PULLEY SHAFT MOUNTING BRACKET
#4 LOCKWASHER
4-40X5/16" SCREW
DIAL MOUNTING PLATE ASSEMBLY 100-M309F
6-32X1/4" SCREW
CONTROL LOCKWASHER
CONTROL NUT
#6 LOCKWASHER
6-32 NUT
6-32 NUT
# 6 LOCKWASHER
PILOT LAMP SHIELD BRACKET 204-M68
# 6 LOCKWASHER
6-32 NUT

Detail 34C

(✓) Mount 1/4" ID x 1/4" long brass bushing on the final amplifier enclosure as shown in Pictorial 32. Use a control lockwasher and control nut.

MOUNTING VFO SUBASSEMBLY

Refer to Pictorial 33 for the following steps.

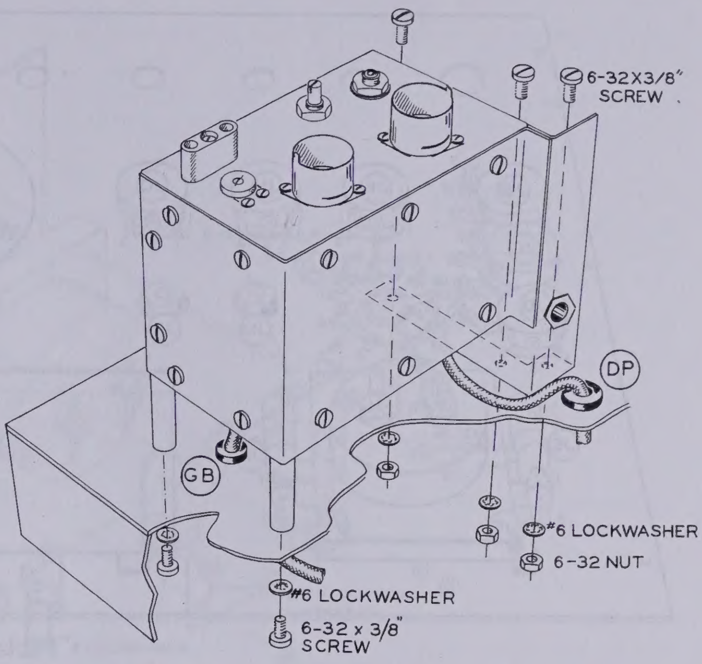
(✓) Referring to Detail 33A prepare a 5-1/2" length of RG58A/U coaxial cable and install a phono plug on one end. Check the cable for a short circuit before proceeding.

(✓) Plug the end of the prepared coaxial cable with the phono plug on it into the phono socket located on the VFO chassis.

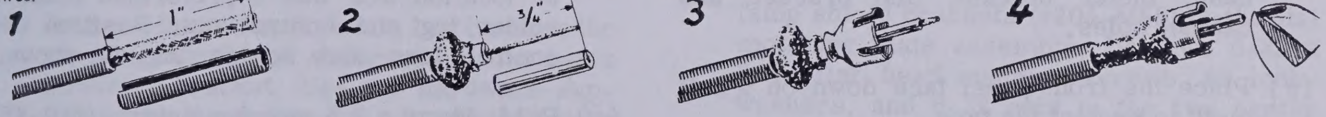
(✓) Position the VFO subassembly on the top plate as shown.

(✓) Place the free end of the coaxial cable through grommet DP, and the free end of the 2-conductor cable through grommet GB.

(✓) Secure the VFO subassembly in place with 6-32 x 3/8" screws and #6 lockwashers in each tapped spacer and three sets of 6-32 x 3/8" hardware on the VFO mounting bracket as shown.



Pictorial 33

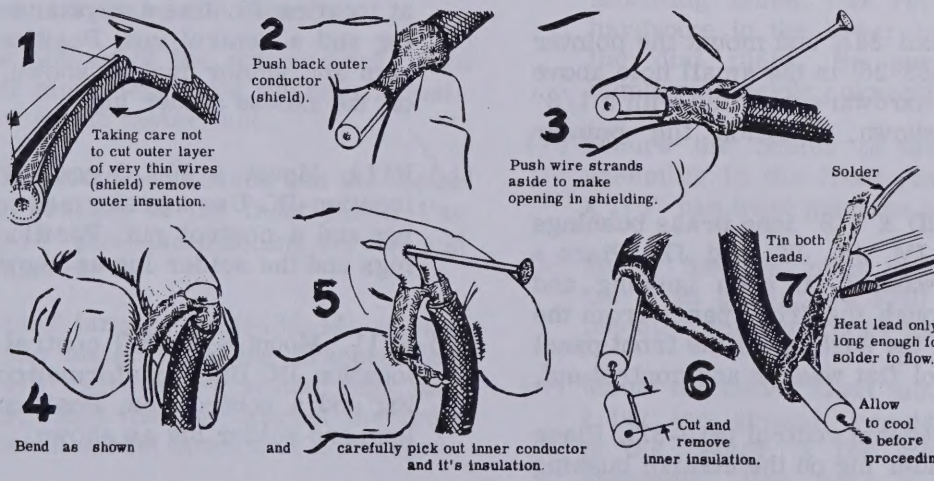


1 Remove 1" of outer insulation. It may be necessary to slit the insulation lengthwise to remove. Take care not to cut shield wires.

2 Push the shield back as far as it will go and strip off 3/4" of insulation from the inner conductor and tin inner conductor.

3 Place phono connector on cable firmly against inner insulation. Solder inner conductor.

4 Dress shield up on base of connector and solder. Then trim inner conductor from tip.



1 Taking care not to cut outer layer of very thin wires (shield) remove outer insulation.

2 Push back outer conductor (shield).

3 Push wire strands aside to make opening in shielding.

4 Bend as shown

5 and carefully pick out inner conductor and it's insulation.

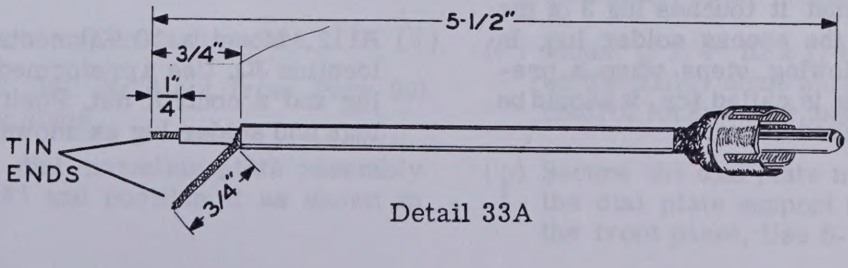
6 Cut and remove inner insulation.

7 Tin both leads.

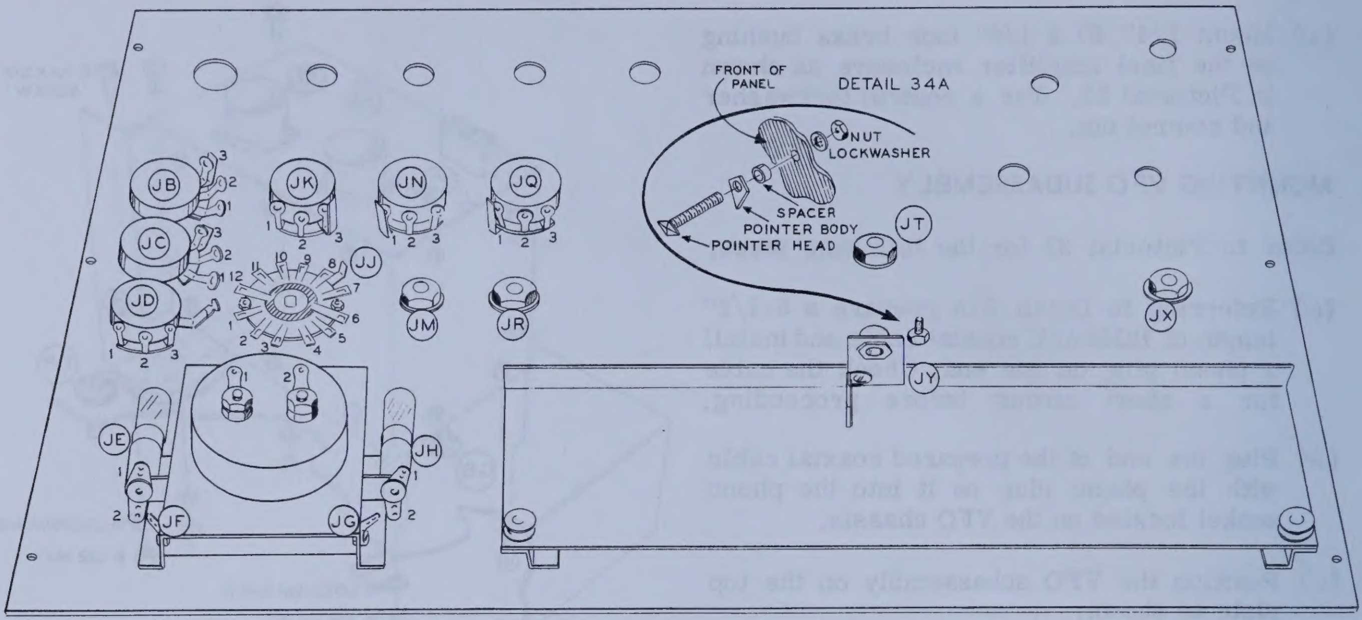
Solder

Heat lead only long enough for solder to flow.

Allow to cool before proceeding.



Detail 33A



Pictorial 34

FRONT PANEL PARTS MOUNTING

Refer to Pictorial 34 for the following steps.

(✓) Locate the front panel and lightly sand any paint from the rear to provide good electrical contact between it and the chassis base, meter bracket, dial bracket, and cabinet holes.

(✓) Place the front panel face down on a soft cloth to protect the face.

(✓) Refer to Detail 34A and mount the pointer assembly (#463-26) in the small hole above JT. Use the hardware supplied with a 1/8" spacer as shown. Position the pointer body down.

(✓) Mount 1/4" ID x 3/8" long brass bushings at locations JM, JR, JT, and JX. Place a control lockwasher on each bushing and insert it through the front panel from the back. Secure the bushing on the front panel with a control flat washer and control nut.

(✓) Locate a 1 megohm control (#10-32). Place a control solder lug on the control bushing and form it so that it touches lug 3 of the control. Cut off the excess solder lug. In each of the following steps when a preformed solder lug is called for, it should be formed as described above.

(✓) R110. Mount the 1 megohm control (#10-32) at JB. Use the preformed solder lug and control nut. Tighten securely. Be sure to position the solder lug and control lugs as shown.

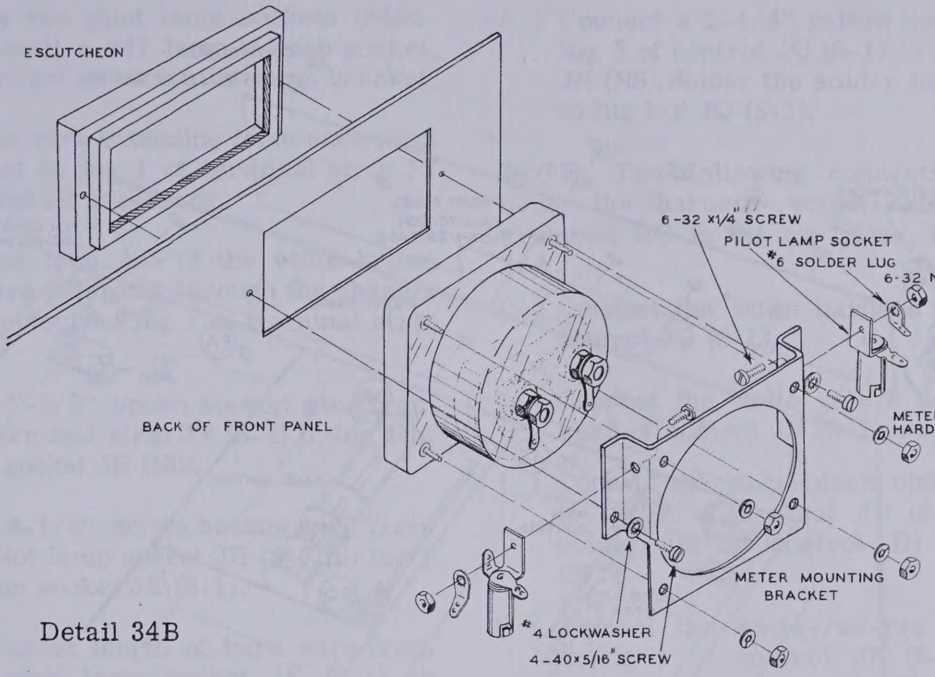
(✓) R109. Mount a 1 megohm control (#10-32) at location JC. Use a preformed control solder lug and control nut. Position the control lugs and solder lug as shown.

(✓) R115. Mount a 7.5 megohm control (#10-45) at location JD. Use a regular control solder lug and a control nut. Position the control lugs and solder lug as shown. Do not cut off the excess solder lug.

(✓) R114. Mount a 600 Ω control (#10-34) at location JK. Use a preformed control solder lug and a control nut. Position the control lugs and the solder lug as shown.

(✓) R111. Mount a 10 KΩ control (#10-31) at location JN. Use a preformed control solder lug and a control nut. Position the control lugs and solder lug as shown.

(✓) R112. Mount a 10 KΩ control (#10-31) at location JQ. Use a preformed control solder lug and a control nut. Position the control lugs and solder lug as shown.



Detail 34B

(✓) Mount the METER switch (#63-94) at location JJ. Use a control solder lug positioned opposite lug 8 of the switch, control flat washer, and control nut. Position the switch lugs as shown in Pictorial 34.

Refer to Detail 34B for the following steps.

(✓) Remove the meter from its box (remove the shorting wire) and secure it to the meter mounting bracket. Use the hardware supplied with the meter. Do not overtighten as you may crack the meter cover.

(✓) With the bottom of the meter down, zero the meter movement using the zero adjusting screw on the meter face.

(✓) Install the meter escutcheon and the meter mounting bracket on the front panel. Use 4-40 x 5/16" pan head machine screws and #4 lockwashers.

(✓) Mount a pilot lamp socket (#434-44) on each side of the meter mounting bracket. Use 6-32 x 1/4" screws, #6 solder lugs, and 6-32 nuts. Bend the lug nearest the front panel on each socket upward at a 90 degree angle.

(   ) Install a pilot lamp in each socket.

Refer to Detail 34C (fold-out from Page 90) for the following steps.

(✓) Locate the dial mounting plate assembly (#100-M309F) and position it as shown in Detail 34C.

NOTE: Carefully peel the paper off the face of the dial plate and wash both sides with a mild detergent. Dry both sides and handle on its edges to prevent finger smudges or dirt from accumulating on it.

(✓) Mount the dial plate (#464-9F450) and the lamp shield brackets (#204-M68) on the dial mounting plate assembly. Use two 6-32 x 3/8" flat head machine screws, #6 lockwashers, and 6-32 nuts in the two center mounting holes. Use regular 6-32 x 3/8" hardware in the lower holes at the end of the dial plate. Be sure the dial plate numbering reads correctly.

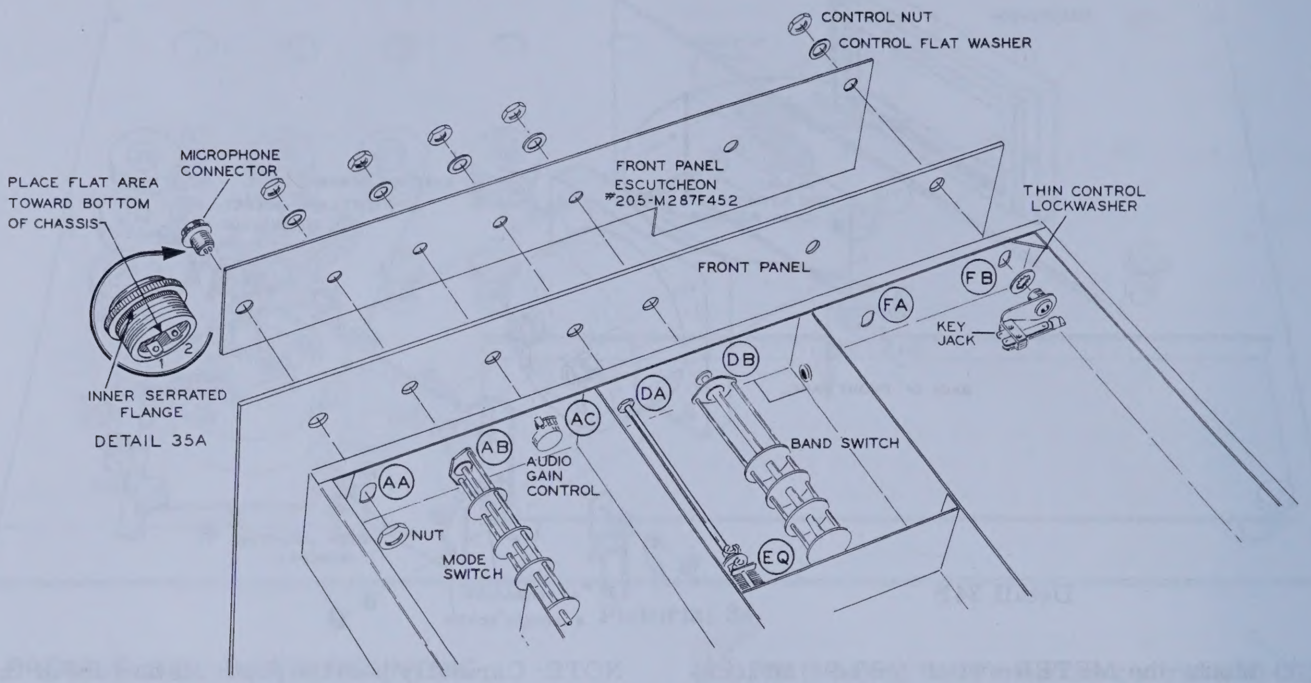
(✓) Secure the center of the dial escutcheon assembly to the front panel with two 4-40 x 1/4" pan head machine screws.

(✓) Mount the dial plate support brackets on the front panel. Use 4-40 x 5/16" pan head machine screws and #4 lockwashers.

(✓) Mount the pulley shaft mounting bracket and 1-lug (no ground) regular terminal strip at the center of the dial plate mounting assembly. Use 6-32 x 3/8" hardware.

(✓) Mount a 1/4" ID x 1/4" long brass bushing on the pulley shaft mounting bracket. Use a control lockwasher and a control nut.

(✓) Secure the dial plate mounting assembly to the dial plate support brackets mounted on the front panel. Use 6-32 x 1/4" hardware.



Pictorial 35

FRONT PANEL-TO-CHASSIS WIRING

Refer to Pictorial 35 for the following steps.

(✓) Remove the control nuts and flat washers previously mounted on the BAND switch, MODE switch and AUDIO control.

(✓) Locate the front panel escutcheon (#205-M287F452) and the front panel assembly.

(✓) Referring to Pictorial 35, mount the front panel and front panel escutcheon to the chassis frame. Use control flat washers and control nuts on the BAND switch, MODE switch, and the AUDIO control. Do not tighten yet.

(✓) Mount the KEY jack (#436-13) at location FB on the chassis frame. Use a thin control lockwasher on the bushing with a control flat washer and control nut on the front panel to secure the jack.

(✓) Mount a 1/4" ID x 9/16" long brass bushing at location DA on the chassis frame. Insert the bushing through a control lockwasher and the chassis frame. Secure the bushing with a control flat washer and control nut.

(✓) Mount the microphone connector at location AA on the chassis frame. Scrape the inside of hole AA with a knife to remove any paint so the inner serrated flange of the microphone connector seats fully in this hole. Use only the nut supplied with the connector. Be sure it is firmly seated in its hole with the connector pins positioned in the upper portion of the connector insert. See Detail 35A.

(✓) Align the panel with the bottom of the chassis and secure all front panel nuts.

(✓) Locate the flexible shaft coupling and mount it on the shaft of variable capacitor EQ. Tighten securely.

(✓) Place a 1/4" x 7" phenolic shaft through bushing DA in the front panel and insert it into the flexible coupler on variable capacitor EQ. Secure the shaft with the setscrew in the coupler.

FINAL WIRING CHASSIS TOP

Refer to Pictorial 36 (fold-out from Page 101) for the following steps.

(✓) Locate the two pilot lamp sockets (#434-85) and install a #47 lamp in each socket. Mount a socket on each pilot lamp bracket.

(✓) Connect the wire extending from each pilot lamp socket to lug 1 of terminal strip JY (NS). Shorten as necessary.

(✓) Connect the free end of the white-brown harness wire extending through the chassis fly wheel cutout to lug 1 of terminal strip JY (NS).

(✓) Connect a 7-5/8" brown hookup wire from lug 1 of terminal strip JY (S-4) to lug 1 of pilot lamp socket JH (NS).

(✓) Connect a 4-1/4" brown hookup wire from lug 1 of pilot lamp socket JH (S-2) to lug 1 of pilot lamp socket JE (S-1).

(✓) Connect a short length of bare wire from lug 2 of pilot lamp socket JE (S-1) to solder lug JF (S-1).

(✓) Connect a short length of bare wire from lug 2 of pilot lamp socket JH (S-1) to solder lug JG (S-1).

(✓) C106. Cut both leads of a .005 μfd disc ceramic capacitor to 1/2". Connect the capacitor between lugs 1 (NS) and 2 (NS) of the meter. See Detail 36A (fold-out from Page 97).

(✓) Connect a 2-1/4" HV blue hookup wire from lug 2 of the meter (S-2) to lug 6 of switch JJ (S-1).

(✓) Connect a 2-1/2" HV blue hookup wire from lug 1 of the meter (S-2) to lug 12 of switch JJ (S-1).

(✓) Pass one end of a length of bare wire through lug 10 (NS) to lug 11 (S-1) of switch JJ. Now solder lug 10 (S-2). Place a 7/8" length of sleeving over the other end of this wire and wrap the free end of the bare wire around the solder lug on switch JJ (NS), and connect the end to lug 8 of JJ (S-1). Now solder the solder lug on JJ (S-2).

(✓) R64. Cut both leads of a 2.2 megohm (red-red-green) 1/2 watt resistor to 1/2". Connect this resistor from lug 3 of control JD (S-1) to the solder lug on control JD (S-1).

( ) Connect a 2-1/4" yellow hookup wire from lug 3 of control JQ (S-1) to lug 3 of control JN (NS). Solder the solder lug on control JQ to lug 1 of JQ (S-1).

NOTE: The following connections are made using the harness wires extending through grommet BC in the top plate. Refer to Detail 36A.

(✓) Connect the white harness wire to lug 2 of control JQ (S-1).

(✓) Connect the white-yellow harness wire to lug 3 of control JN (S-2).

(✓) Connect the white-black-black harness wire to lug 2 of control JN (S-1). Solder the solder lug on control JN to lug 1 of JN (S-1).

(✓) Connect the white-red-red harness wire to lug 1 of control JK (S-1). Solder the solder lug on control JK to lug 3 of JK (S-1).

(✓) Connect the white-red harness wire to lug 5 of switch JJ (S-1).

(✓) Connect the white-green harness wire to lug 7 of switch JJ (S-1).

(✓) Connect the white-orange harness wire to lug 9 of switch JJ (S-1).

(✓) Connect the white-gray harness wire to lug 1 of switch JJ (S-1).

(✓) Connect the white-brown-brown harness wire to lug 2 of switch JJ (S-1).

(✓) Connect the white-blue-blue harness wire to lug 3 of switch JJ (S-1).

(✓) Connect the inner conductor of the black shielded cable with green band to lug 2 of control JC (S-1). Connect the shield to lug 3 of JC (NS).

(✓) Connect the inner conductor of the black shielded cable with blue band to lug 1 of control JC (S-1). Connect the shield to lug 3 of JC (S-3).

(✓) Connect a 2-5/8" HV blue hookup wire from lug 4 of switch JJ (S-1) to lug 2 of control JK (S-1).

(✓) Solder the solder lug on control JB to lug 3 of JB (S-1).

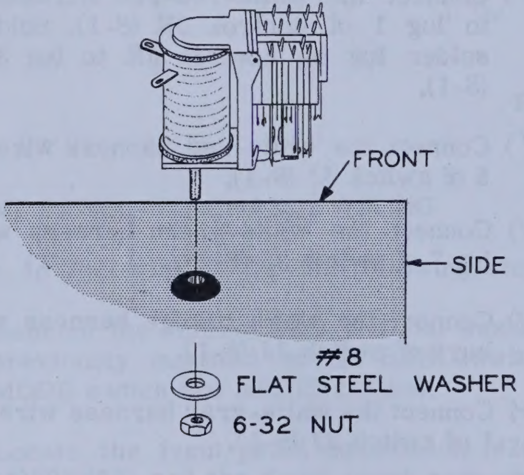
NOTE: The following three steps are made using the harness wires extending from grommet BB. Refer to Detail 36A.

(✓) Connect the short white-green harness wire to lug 2 of control JB (S-1).

(✓) Connect the white-brown-brown harness wire to lug 1 of control JB (S-1).

(✓) Connect the long white-green-green harness wire to lug 2 of control JD (S-1).

(✓) Referring to Detail 36B, mount the 5-pole telephone type relay (#69-6) at location K. Use the thin flat steel washer (#253-25) and a 6-32 nut.



Detail 36B

Refer to Detail 36C for the following steps.

NOTE: The following connections are made to relay K. The harness wires refer to those extending from grommet BB.

(✓) Place a 1/2" length of sleeving over each harness wire except the white-violet wires. This sleeving will later be slipped over the relay lugs to prevent shorting.

(✓) Connect one end of a 2-1/4" length of bare wire to lug 2 of K (S-1). Place a 1/2" length of sleeving over the wire and the relay lug. Connect the other end of this wire to solder lug JZ (NS).

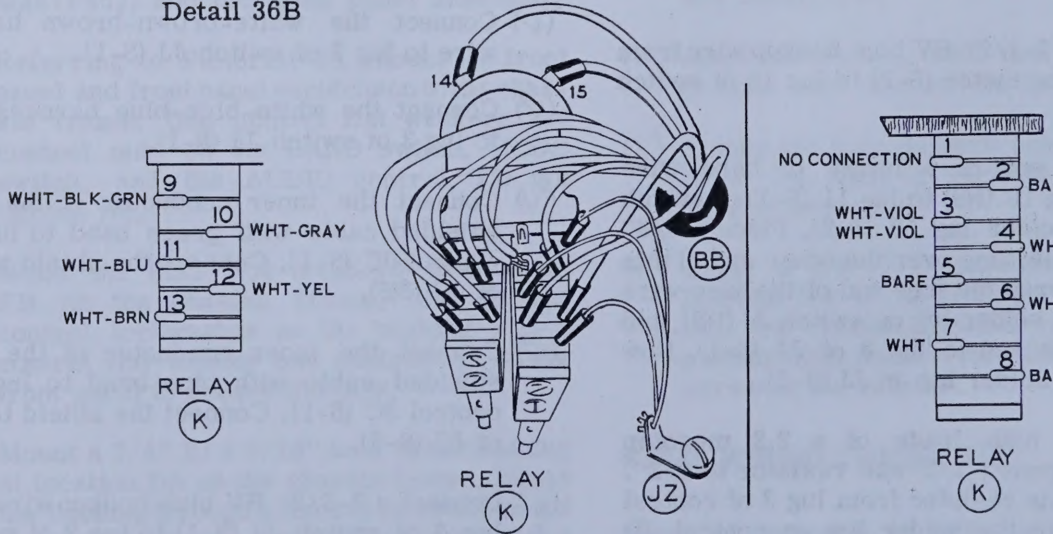
(✓) Connect both white-violet wires to lug 3 of K (S-2).

(✓) Connect the white-orange-yellow harness wire to lug 4 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect one end of a 2-1/2" length of bare wire to lug 5 of K (S-1). Place a 1/2" length of sleeving on this wire and slip it over the relay lug. Connect the other end of this wire to solder lug JZ (NS).

(✓) Connect the white-black-black harness wire to lug 6 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect the white harness wire to lug 7 of K (S-1). Slip the sleeving over the relay lug.



Detail 36C

(✓) Connect one end of a 2-1/2" length of bare wire to lug 8 of K (S-1). Place a length of sleeving over the bare wire and relay lug. Connect the other end of this wire to solder lug JZ (S-3).

(✓) Connect the white-black-green harness wire to lug 9 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect the white-gray harness wire to lug 10 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect the white-blue harness wire to lug 11 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect the white-yellow harness wire to lug 12 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect the white-brown harness wire to lug 13 of K (S-1). Slip the sleeving over the relay lug.

(✓) Connect either of the two remaining white-red harness wires to lug 14 of K (S-1).

(✓) Connect the other white-red harness wire to lug 15 of K (S-1).

NOTE: Where the following shafts are placed through bushings, it is recommended that a small amount of vaseline or petroleum jelly be used as a lubricant on the shafts to reduce friction. These lubricants or a thinner oil, used sparingly, may also be used on the worm and worm drive gears.

Refer to Detail 36D for the following steps.

(✓) Place a 1/4" OD x 6-11/16" tuning shaft through the brass bushing at JT in the front panel.

(✓) Start two 6-32 x 1/2" round head machine screws in the flywheel. Place the flywheel over the tuning shaft extending through JT. Do not tighten yet.

(✓) Start an 8-32 x 1/8" Allen setscrew in the coarse worm gear (#451-29). Place this gear on the tuning shaft, extending from bushing JT. Do not tighten yet.

(✓) Start an 8-32 x 1/8" Allen setscrew in a shaft collar. Place this collar on the tuning shaft. Do not tighten.

(✓) Start an 8-32 x 1/8" Allen setscrew in the remaining fine worm gear and place it on the tuning shaft. Do not tighten.

(✓) Start an 8-32 x 1/8" Allen setscrew in a collar and place it on the end of the tuning shaft extending through JT. Do not tighten. Do not slide beyond the phenolic gear.

(✓) Place the free end of the tuning shaft extending from bushing JT through the bushing on the flange of the VFO mounting bracket.

(✓) Locate the large metal knob and secure the vernier dial plate to the back of the knob with 6-32 x 3/8" flat head machine screws.

(✓) Start two 8-32 x 1/4" Allen setscrews into the knob.

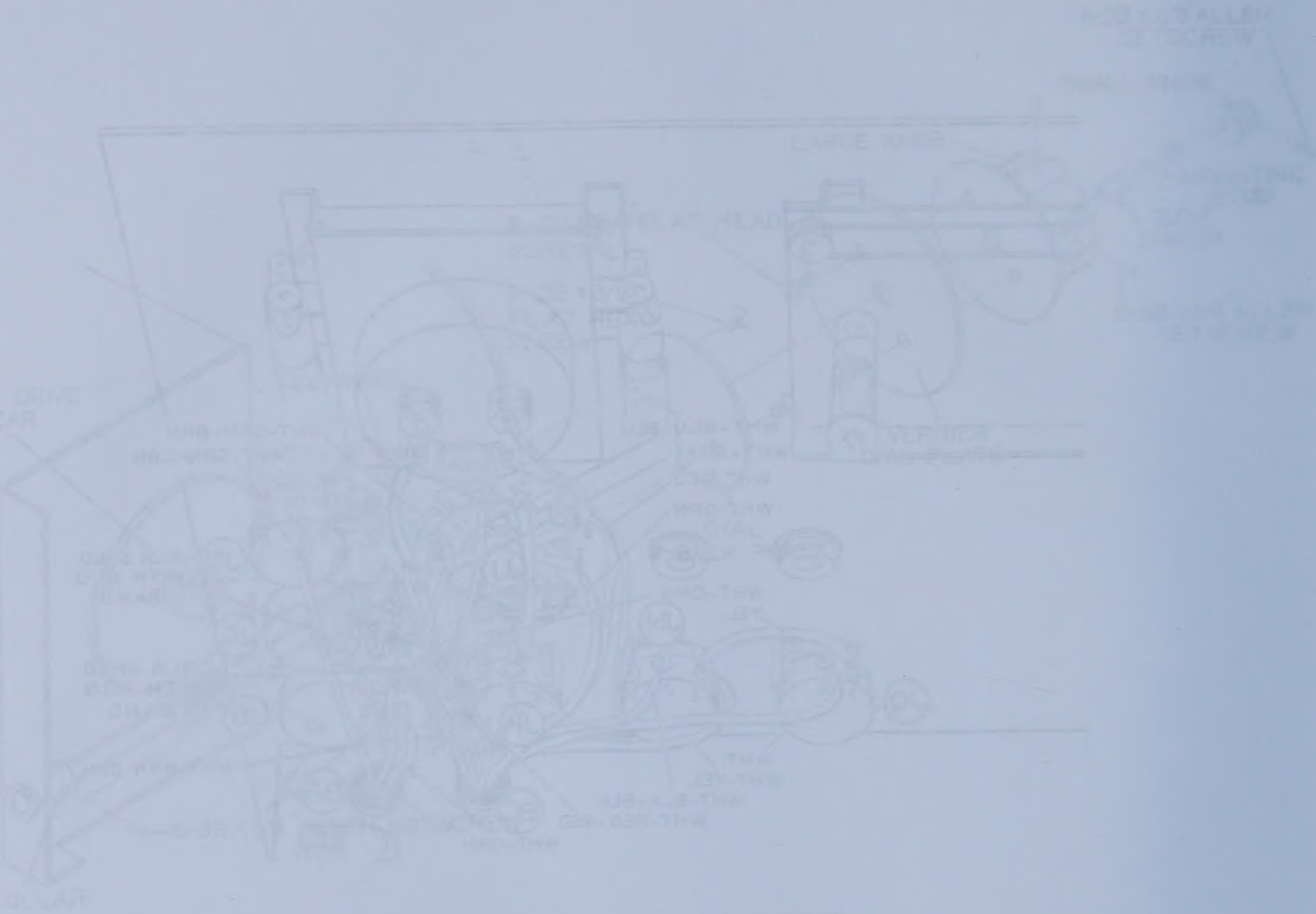
(✓) Place the 13/32" spacer over the mounting stud and screw the stud into the front of the large knob. Lubricate this spacer with a drop of light oil.

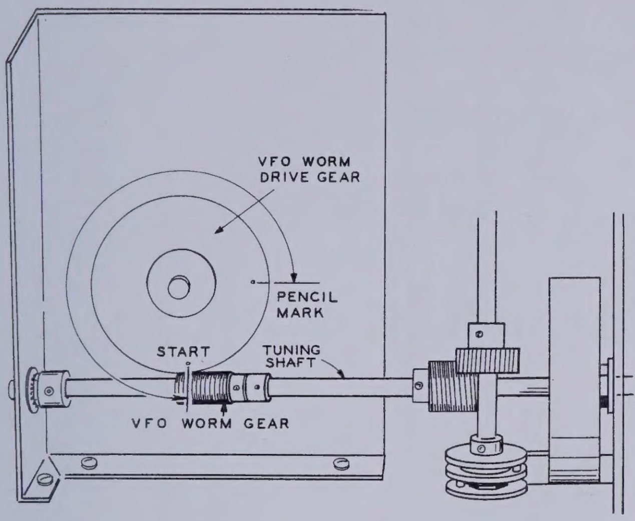
(✓) Start an 8-32 x 1/8" Allen setscrew in one of the small knobs and mount it on the spacer mounted in the previous step. Secure the small knob with the setscrew.

(✓) Mount the dial back plate on the front panel with 6-32 x 3/16" flat head machine screws. Position as shown.

(✓) Place the large knob on the front panel side of the tuning shaft until the shaft bottoms in the knob. Secure the knob with the setscrews.

(✓) Holding the large knob against bushing JT, push the flywheel flush with the rear of bushing JT and secure it to the shaft with the 6-32 setscrews. The knob should turn freely with no excess horizontal motion. If the knob does not rotate parallel with the front panel, it may be gently tapped on any high spot using a non-metallic object to protect the knob finish.


4-32 x 1/8 ALLEN
SETSCREW
SMALL KNOB
LARGE WASH
HEAD
VERNIER



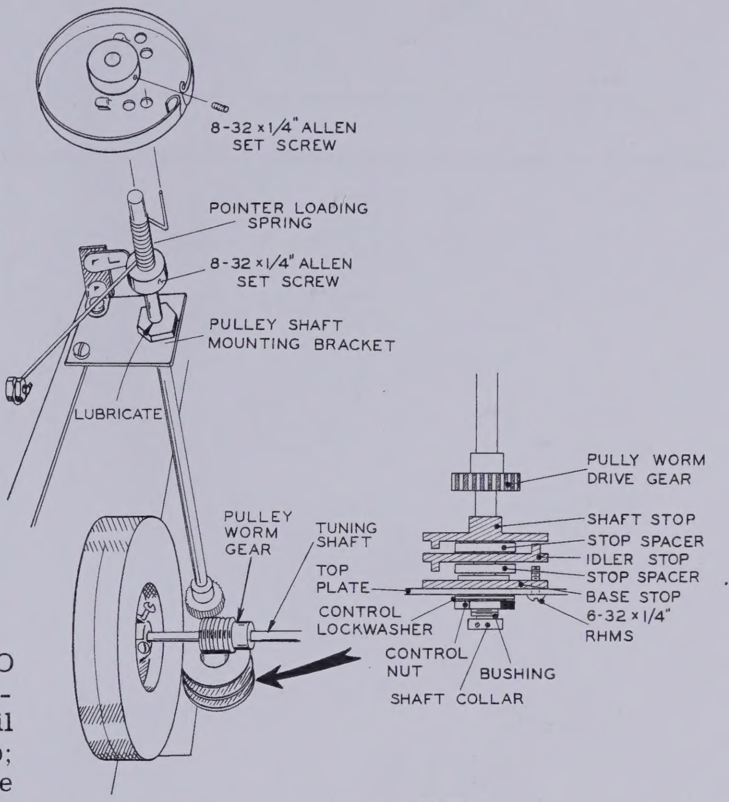
Detail 36E

(✓) Referring to Detail 36E, turn the VFO worm drive gear on the VFO tuning capacitor shaft clockwise 270 degrees until the pencil marks made previously line up; then mesh the worm drive gear with the worm gear on the tuning shaft. When the worm drive gear is meshed, the pencil marks should line up and there should be a small amount of play between the phenolic worm drive gear and the worm gear. The proper spacing between the two gears is made by adjusting the position of the bushing in the rear of the VFO mounting bracket. Tighten the VFO worm gear setscrew temporarily.

NOTE: When the pencil marks are lined up, this represents the full counterclockwise position of the VFO worm drive gear and the fully clockwise position of the VFO tuning knob. Movement of the VFO worm drive gear is ALWAYS clockwise from its present position and never exceeds 180 degrees.

(✓) Turn the large knob several times and adjust this gear and bushing until free rotation is obtained. Return to the pencil marked position when completed.

(✓) Temporarily tighten the rear collar against the rear bushing.



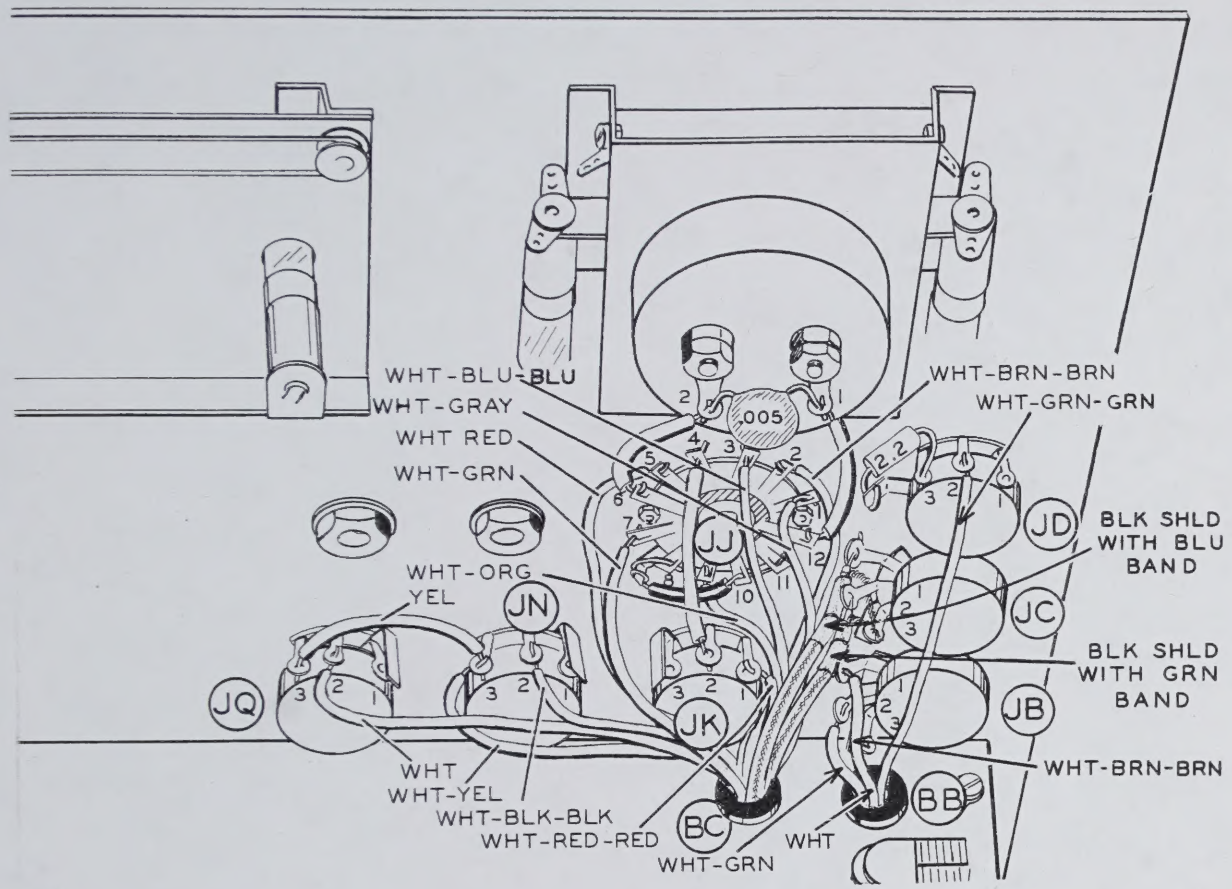
Detail 36F

Refer to Details 36E and 36F for the following steps.

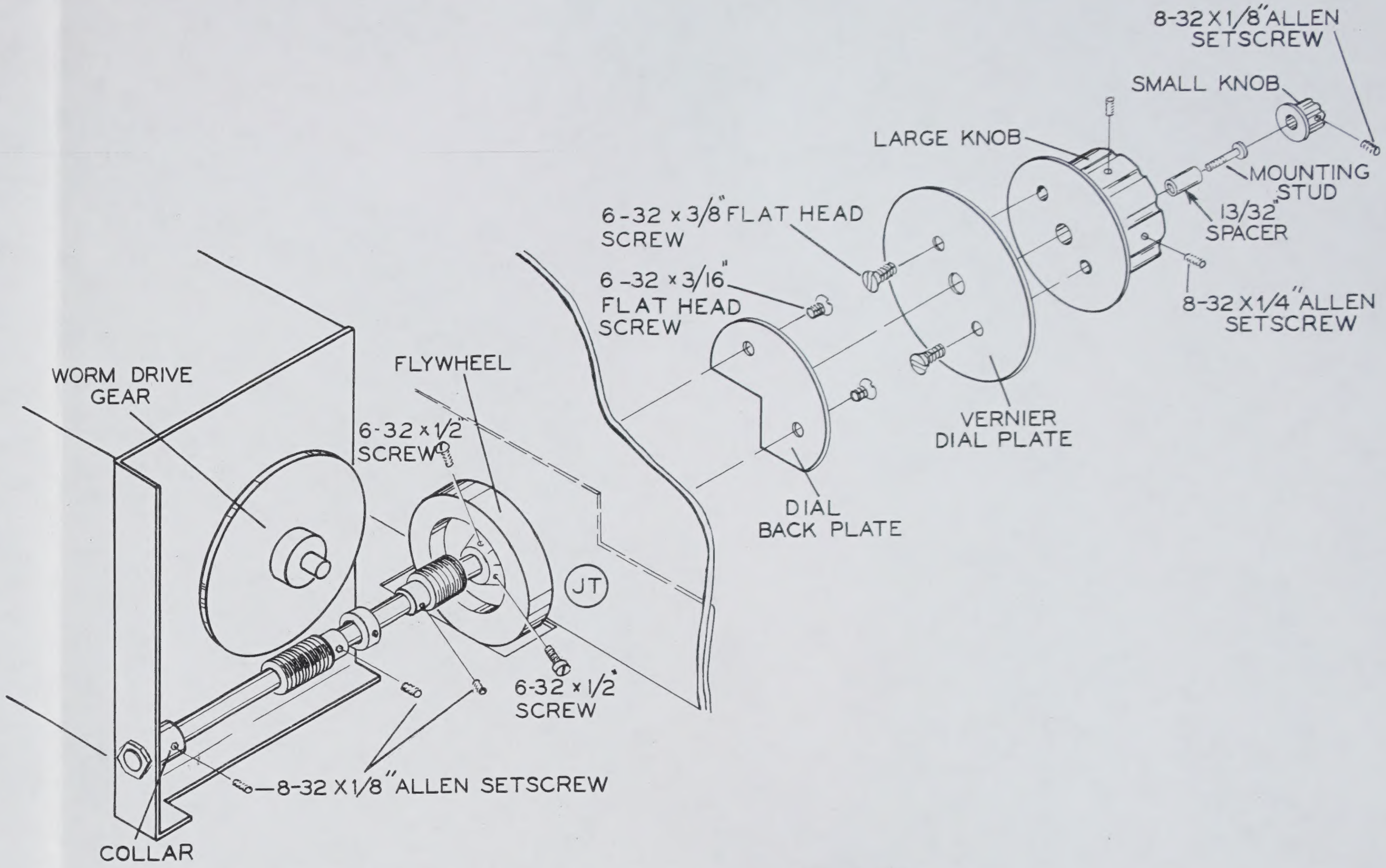
(✓) Start an 8-32 x 1/8" Allen setscrew in two collars, the shaft stop, and in the steel pulley worm drive gear (#451-31).

(✓) Locate the remaining 1/4" OD x 6-11/16" long metal shaft, install a collar flush with one end of the shaft and tighten the setscrew. Place the other end of the shaft through bushing DK on the top plate from under the chassis.

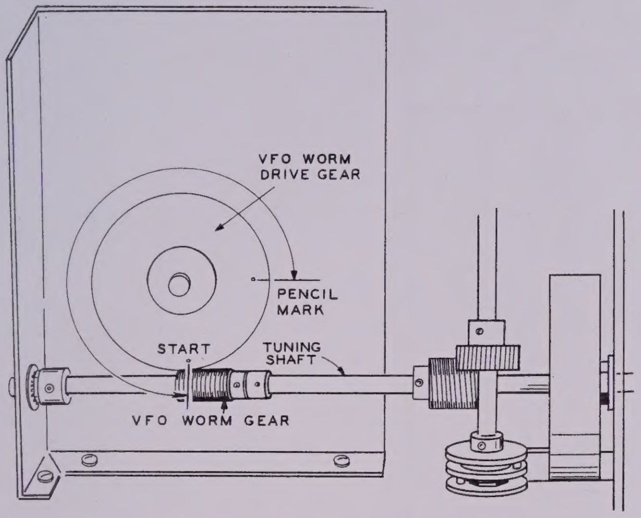
(✓) Lubricating each part, place a spacer (#253-53) over the 6-11/16" shaft, followed by the idler stop, another spacer, the shaft stop, and the steel pulley worm drive gear. Keep this gear above the center of the tuning shaft. Push the shaft on through the bushing in the top plate until it fits into the bushing located on the pulley shaft mounting bracket. (These bushings must be aligned so this shaft turns freely.) Now place a collar over the top end of this shaft. Do not tighten.



Detail 36A



Detail 36D



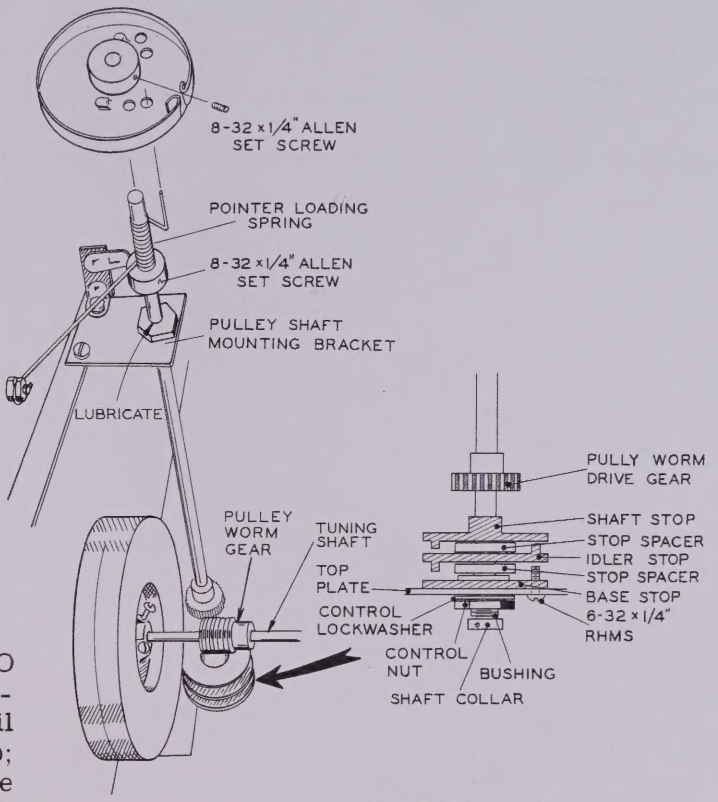
Detail 36E

(✓) Referring to Detail 36E, turn the VFO worm drive gear on the VFO tuning capacitor shaft clockwise 270 degrees until the pencil marks made previously line up; then mesh the worm drive gear with the worm gear on the tuning shaft. When the worm drive gear is meshed, the pencil marks should line up and there should be a small amount of play between the phenolic worm drive gear and the worm gear. The proper spacing between the two gears is made by adjusting the position of the bushing in the rear of the VFO mounting bracket. Tighten the VFO worm gear setscrew temporarily.

NOTE: When the pencil marks are lined up, this represents the full counterclockwise position of the VFO worm drive gear and the fully clockwise position of the VFO tuning knob. Movement of the VFO worm drive gear is ALWAYS clockwise from its present position and never exceeds 180 degrees.

(✓) Turn the large knob several times and adjust this gear and bushing until free rotation is obtained. Return to the pencil marked position when completed.

(✓) Temporarily tighten the rear collar against the rear bushing.



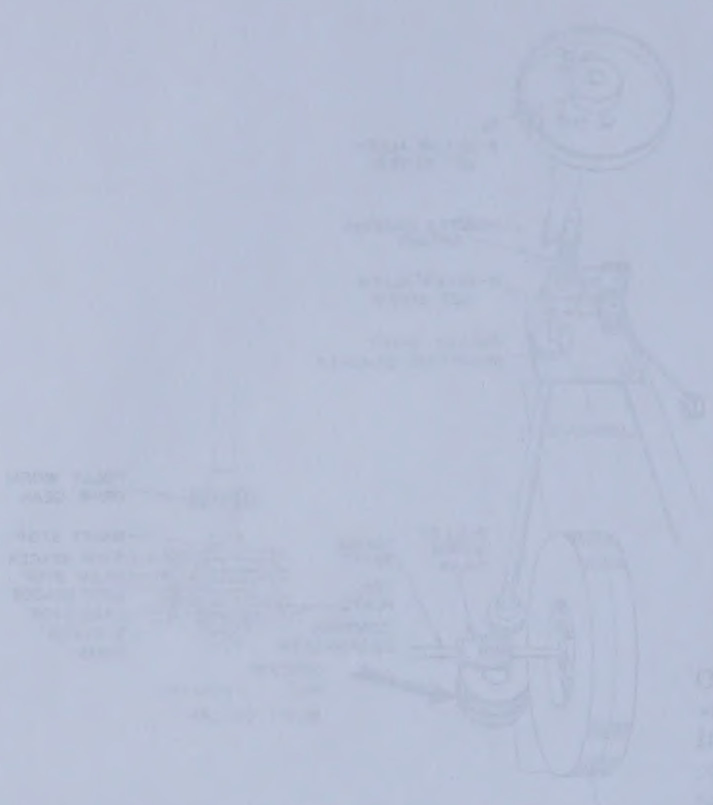
Detail 36F

Refer to Details 36E and 36F for the following steps.

(✓) Start an 8-32 x 1/8" Allen setscrew in two collars, the shaft stop, and in the steel pulley worm drive gear (#451-31).

(✓) Locate the remaining 1/4" OD x 6-11/16" long metal shaft, install a collar flush with one end of the shaft and tighten the setscrew. Place the other end of the shaft through bushing DK on the top plate from under the chassis.

(✓) Lubricating each part, place a spacer (#253-53) over the 6-11/16" shaft, followed by the idler stop, another spacer, the shaft stop, and the steel pulley worm drive gear. Keep this gear above the center of the tuning shaft. Push the shaft on through the bushing in the top plate until it fits into the bushing located on the pulley shaft mounting bracket. (These bushings must be aligned so this shaft turns freely.) Now place a collar over the top end of this shaft. Do not tighten.



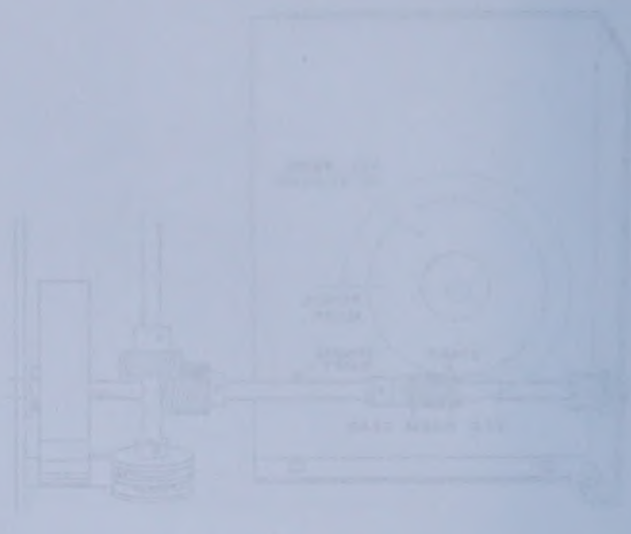
Detail 29F

Refer to Details 29D and 29F for the following steps.

( ) Start an 8-32 x 1/8" Allen setscrew in two collars, the shaft stop, and in the steel pulley worm drive gear (#455-31).

(✓) Locate the remaining 1/4" OD x 6-11/16" long metal shaft. Install a collar flush with one end of the shaft and tighten the setscrew. Place the other end of the shaft through bushing DK on the top plate from under the chassis.

( ) Lubricating each part, place a spacer (#253-53) over the 6-11/16" shaft, followed by the idler stop, another spacer, the shaft stop, and the steel pulley worm drive gear. Keep this gear above the center of the tuning shaft. Push the shaft on through the bushing in the top plate until it fits into the bushing located on the pulley shaft mounting bracket. (These bushings must be aligned so this shaft turns freely.) Now place a collar over the top end of this shaft. Do not tighten.



Detail 29E

( ) Referring to Detail 29E, turn the VFO worm drive gear on the VFO tuning capacitor shaft clockwise 270 degrees until the pencil marks made previously line up; then mesh the worm drive gear with the worm gear on the tuning shaft. When the worm drive gear is meshed, the pencil marks should line up and there should be a small amount of play between the phenolic worm drive gear and the worm gear. The proper spacing between the two gears is made by adjusting the position of the bushing in the rear of the VFO mounting bracket. Tighten the VFO worm gear setscrew temporarily.

NOTE: When the pencil marks are lined up, this represents the full counterclockwise position of the VFO worm drive gear and the fully clockwise position of the VFO tuning knob. Movement of the VFO worm drive gear is ALWAYS clockwise from the present position and only approximately 180 degrees.

( ) Turn the large knob several times and adjust the gear bushing until free rotation is obtained, [illegible] the pencil marked [illegible] is [illegible].

( ) Temporarily tighten the rear collar against the rear bushing.

E
S

(✓) While holding the bottom collar against the bottom bushing, push the shaft stop down against the spacers and idler stop, and then tighten the setscrew to secure it in place. Rotate the shaft stop fully clockwise as viewed from the top. This limits vertical shaft motion. Check to be sure this shaft turns freely and stops are contacted at each end of rotation. Lubricate the shaft at the point shown in Detail 36F.

(✓) Before performing the following step, be sure the VFO drive gear is lined up at the pencil mark.

(✓) Move the pulley worm drive gear down until it is above the center of the shaft extending through bushing JT in the front panel. Tighten the setscrew temporarily.

(✓) Loosely mesh the pulley worm gear with the pulley worm drive gear (3 teeth). Now secure the worm gear using the setscrew. It is normal to have backlash between these two gears. The pulley worm drive gear must be maintained above the center of the tuning shaft.

(✓) Place the short end of the pointer loading spring through the dial drum hole and mount the dial drum and spring on the previously installed shaft as shown. Position the drum flush with the top of the shaft. Start an 8-32 x 1/4" Allen setscrew in the dial drum bushing but do not tighten.

(✓) Referring to Detail 36F, holding the dial drum flush with the end of its shaft, push the collar up to lightly contact the spring and tighten the collar setscrew. Rotate the dial drum three turns in a clockwise direction and tighten the dial drum setscrew. Place the other end of the pointer loading spring around the 6-32 screw on the rear of the dial plate (form as shown) and secure with a 6-32 nut.

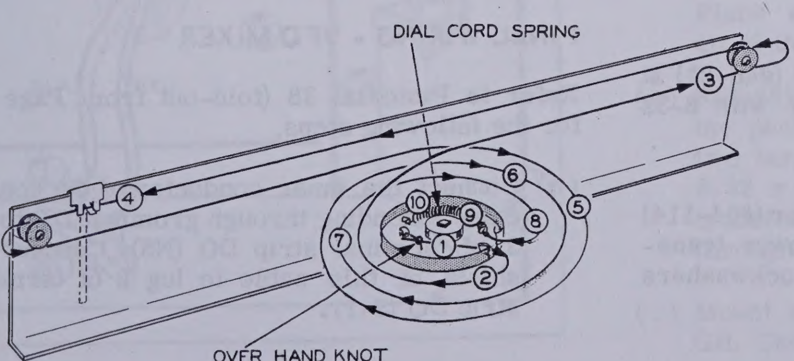
(✓) Install the dial cord on the dial mounting plate assembly as shown in Detail 36G.

(✓) Locate the dial pointer (#463-25) and place it on the dial mounting plate assembly as shown. Place the dial cord between the fingers of the pointer and gently squeeze the center finger up. Rotate the tuning shaft and adjust the position of the dial pointer to be sure that the same amount of pointer travel is evident on each side of center on the dial face. Now securely fasten the pointer by raising the center dial pointer finger. Be careful not to cut the dial cord.

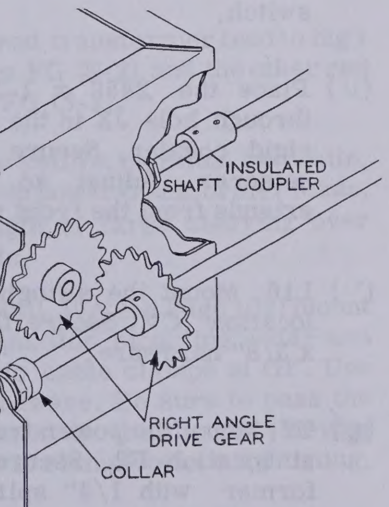
(✓) Referring again to Pictorial 36, place the 1/4" x 15-1/8" extension shaft through bushing JM in the front panel. Start 8-32 x 1/8" Allen setscrews in two collars. Slip one of the collars over the end of the shaft.

(✓) Start an 8-32 x 1/8" Allen setscrew in each of the right angle drive gears.

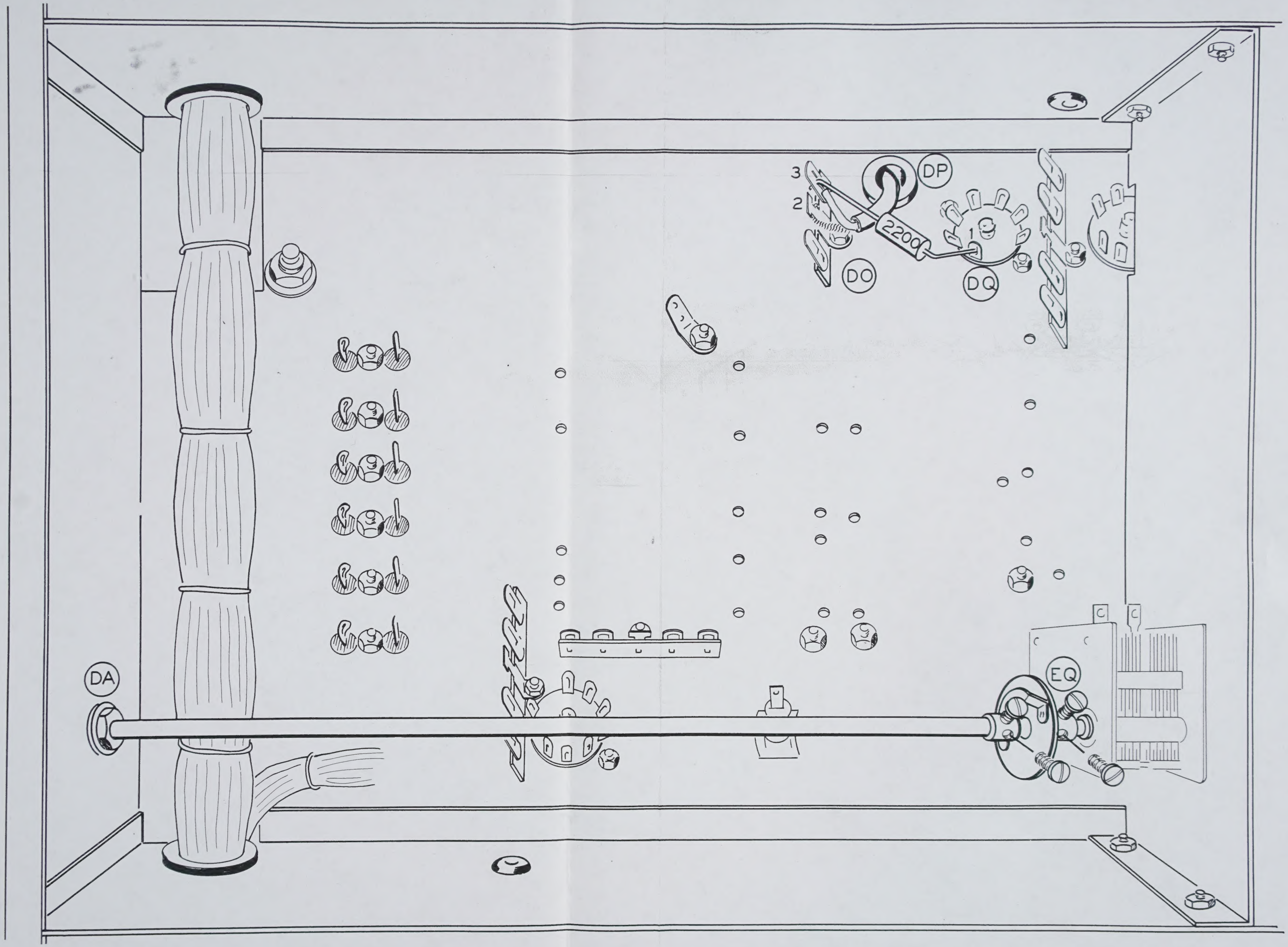
( ) Referring to Detail 36H, mount one of these gears with its bushing flush with the end of the shaft of the loading capacitor extending through the side of the final amplifier compartment. Tighten the setscrew securely.



Detail 36G



Detail 36H



Pictorial 38

(✓) While holding the bottom collar against the bottom bushing, push the shaft stop down against the spacers and idler stop, and then tighten the setscrew to secure it in place. Rotate the shaft stop fully clockwise as viewed from the top. This limits vertical shaft motion. Check to be sure this shaft turns freely and stops are contacted at each end of rotation. Lubricate the shaft at the point shown in Detail 36F.

(✓) Before performing the following step, be sure the VFO drive gear is lined up at the pencil mark.

(✓) Move the pulley worm drive gear down until it is above the center of the shaft extending through bushing JT in the front panel. Tighten the setscrew temporarily.

(✓) Loosely mesh the pulley worm gear with the pulley worm drive gear (3 teeth). Now secure the worm gear using the setscrew. It is normal to have backlash between these two gears. The pulley worm drive gear must be maintained above the center of the tuning shaft.

(✓) Place the short end of the pointer loading spring through the dial drum hole and mount the dial drum and spring on the previously installed shaft as shown. Position the drum flush with the top of the shaft. Start an 8-32 x 1/4" Allen setscrew in the dial drum bushing but do not tighten.

(✓) Referring to Detail 36F, holding the dial drum flush with the end of its shaft, push the collar up to lightly contact the spring and tighten the collar setscrew. Rotate the dial drum three turns in a clockwise direction and tighten the dial drum setscrew. Place the other end of the pointer loading spring around the 6-32 screw on the rear of the dial plate (form as shown) and secure with a 6-32 nut.

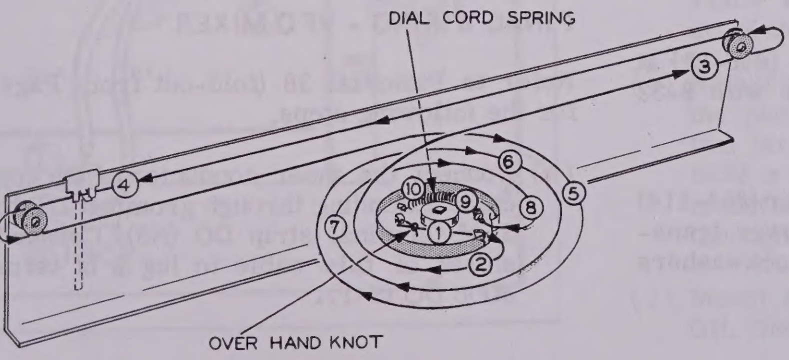
(✓) Install the dial cord on the dial mounting plate assembly as shown in Detail 36G.

(✓) Locate the dial pointer (#463-25) and place it on the dial mounting plate assembly as shown. Place the dial cord between the fingers of the pointer and gently squeeze the center finger up. Rotate the tuning shaft and adjust the position of the dial pointer to be sure that the same amount of pointer travel is evident on each side of center on the dial face. Now securely fasten the pointer by raising the center dial pointer finger. Be careful not to cut the dial cord.

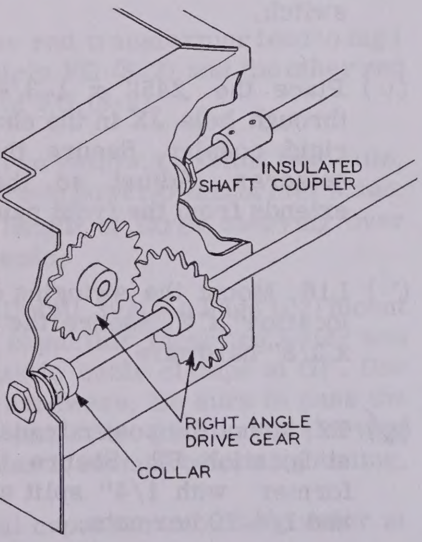
(✓) Referring again to Pictorial 36, place the 1/4" x 15-1/8" extension shaft through bushing JM in the front panel. Start 8-32 x 1/8" Allen setscrews in two collars. Slip one of the collars over the end of the shaft.

(✓) Start an 8-32 x 1/8" Allen setscrew in each of the right angle drive gears.

( ) Referring to Detail 36H, mount one of these gears with its bushing flush with the end of the shaft of the loading capacitor extending through the side of the final amplifier compartment. Tighten the setscrew securely.



Detail 36G



Detail 36H

(✓) Place the other right angle gear on the shaft installed previously at JM. Then place the other prepared collar on the shaft.

(✓) Place the end of the shaft in the bushing mounted on the flange of the final amplifier compartment until it is recessed 1/16" from the rear of the bushing. Place the collar against the bushing and tighten the setscrew securely.

(✓) Move the right angle gear on the control shaft until it meshes with the gear on the loading capacitor, then tighten the setscrew securely. Adjust these gears to turn freely.

(✓) Now move the first collar against bushing JM and tighten.

(✓) Start two 8-32 x 1/8" Allen setscrews into the insulated shaft coupler. Secure one end of the coupler to the end of the tuning capacitor shaft extending through the front of the final amplifier compartment.

(✓) Place the 1/4" x 9" extension shaft through bushing JR in the front panel and into the rigid coupler on the tuning capacitor. Secure the coupler to the shaft. Adjust so that 5/16" of shaft extends from the front panel.

(✓) Start two 6-32 x 1/8" slotted setscrews into a rigid coupler. Secure one end of the coupler to the shaft of the VFO CRYSTAL switch.

(✓) Place the .245" x 1-3/4" phenolic shaft through hole JX in the chassis and into the rigid coupler. Secure the shaft with the setscrew. Adjust so that 3/8" of shaft extends from the front panel.

(✓) L16. Mount the swinging choke (#46-21) at location CV. Secure the choke with 8-32 x 3/8" hardware.

(✓) T2. Mount the power transformer (#54-114) at location F2. Secure the power transformer with 1/4" split steel lockwashers and 1/4-20 hex nuts.

FINAL WIRING-TONE OSCILLATOR AND MICROPHONE INPUT SECTIONS

Refer to Pictorial 37 for the following steps.

(✓) Connect the white-orange lead from Breakout #34 of the harness to lug 2 of connector AA (NS).

(✓) Connect the inner conductor of the black shielded cable from Breakout #34 of the harness to lug 1 of connector AA (S-1). Connect the shield of this cable to ground lug at AZ (NS).

(✓) C148. Cut both leads of a .01 μfd disc ceramic capacitor to 1/2". Connect one lead to ground lug AZ (S-2). Connect the other lead to pin 2 of microphone receptacle AA (S-2).

(✓) Connect the bare wire of audio transformer BA going away from the top plate to the ground lug on the foot of BA (S-1).

(✓) Connect the other bare wire of audio transformer BA to lug 3 of control BG (S-1). Use sleeving.

(✓) Connect the blue audio transformer lead to lug 1 of tube socket BH (S-2).

(✓) Connect the red audio transformer lead to lug 2 of terminal strip AY (S-5).

Refer to Detail 37A for the next two steps.

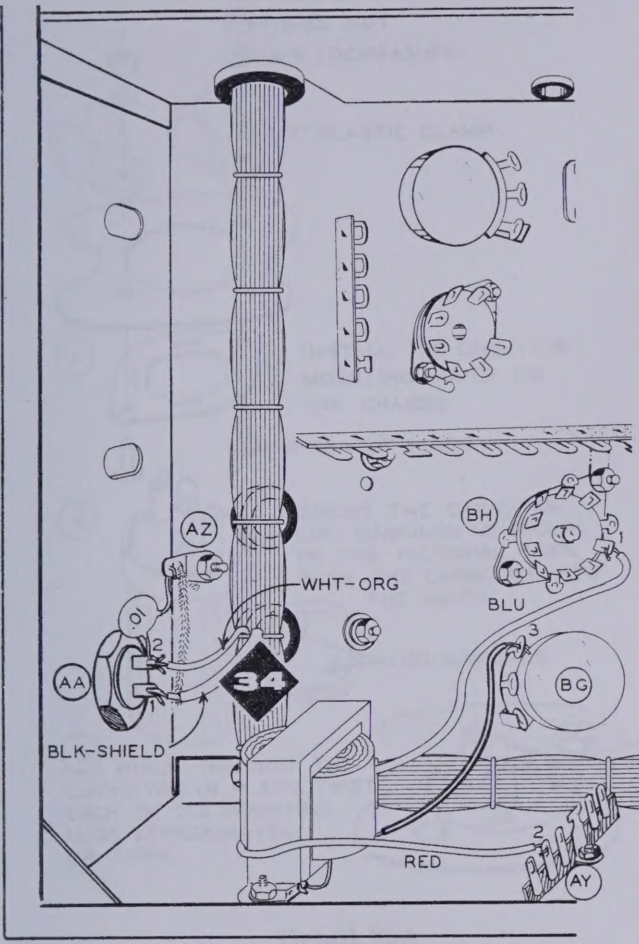
(✓) Connect the black lead extending from swinging choke CV to lug 2 of terminal strip AT (S-2).

(✓) Connect the red lead of choke CV to lug 1 of terminal strip AT (S-2).

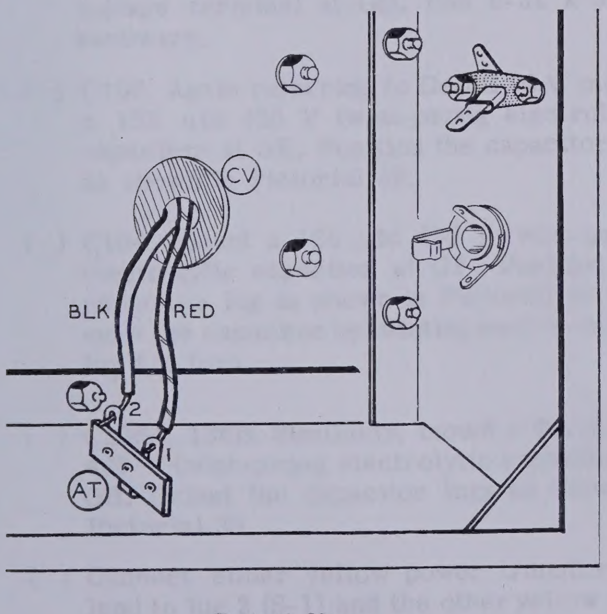
FINAL WIRING - VFO MIXER

Refer to Pictorial 38 (fold-out from Page 98) for the following steps.

(✓) Connect the inner conductor of the coaxial cable extending through grommet DP to lug 3 of terminal strip DO (NS). Connect the shield of this cable to lug 2 of terminal strip DO (S-1).



Pictorial 37



Detail 37A

(✓) R122. Cut both leads of a 2200 (red-red-red) 1/2 watt resistor to 1/2". Connect this resistor from lug 3 of terminal strip DO (S-2) to lug 1 of tube socket DQ (S-3).

NOTE: Before the next step, remove the pilot lights from their sockets and measure the resistance to ground from lug 4 of terminal strip FE. It should read infinity. If any resistance is shown, check the filament lugs of each stage to remove any short circuit before proceeding to the next step.

FINAL WIRING-POWER SUPPLY

Refer to Pictorial 39 (fold-out from Page 105) for the following steps. Route the transformer leads as shown. Strip and tin to conform to Pictorial 39.

(✓) Separate the two black transformer leads and place a 3-3/4" length of the medium sleeving over both.

(✓) Connect either black transformer lead to lug 1 of terminal strip FE (NS) and the other black lead to lug 2 of FE (S-3).

(✓) Connect either green power transformer lead to lug 3 of terminal strip FE (NS) and the other green lead to lug 4 of FE (S-3).

(✓) Separate the two red power transformer leads and place a 4" length of medium sleeving over both.

(✓) Connect either red transformer lead to lug 1 of terminal strip FG (S-2) and the other red lead to lug 4 of FG (S-2).

(✓) Separate the two yellow, two blue, two white, and the two brown power transformer leads. Place a 5" length of large sleeving over all of these leads.

(✓) Referring to Detail 39A (on Page 102) mount the phenolic capacitor mounting wafer and two large plastic cable clamps at GF. Use 6-32 x 3/8" hardware. Be sure to pass the transformer leads in the large sleeving through the plastic clamps before tightening.

(✓) Mount a metal capacitor mounting wafer at GH. Use 6-32 x 1/4" hardware.

( ) Connect [illegible] to lug 1 of [illegible] (NS).

NOTE: [illegible] check each [illegible] of solder [illegible] each stage to remove any excess solder before proceeding to the next step.

FINAL WIRING—POWER SUPPLY

Refer to Pictorial 39 (fold-out from page 200) for the following steps. [illegible] Pictorial 39.

( ) Prepare [illegible] 5-3/4" length [illegible]

( ) Connect either [illegible] to lug 1 of terminal strip [illegible] (NS) [illegible] lug 2 [illegible] (S-2).

( ) Connect [illegible] (S-3).

( ) Prepare [illegible]

( ) Connect either [illegible] lug 1 of terminal strip [illegible]

( ) Position the [illegible] Place a [illegible] over all of these leads.

( ) Referring [illegible] two large [illegible] 6-32 x 1/4" hardware [illegible]

( ) Mount a [illegible] at GH. Use 6-32 x 3/8" hardware.

FINAL WIRING—[illegible] OSCILLATOR AND [illegible]

Refer to Pictorial [illegible] for the following steps.

( ) Connect the white [illegible]

( ) Connect the [illegible] lug of [illegible] (NS).

( ) [illegible] ceramic capacitor [illegible] ground lug [illegible] to pin 2 [illegible] AA (S-2).

( ) Connect the bare wire [illegible] lug on the [illegible]

( ) Connect the [illegible]

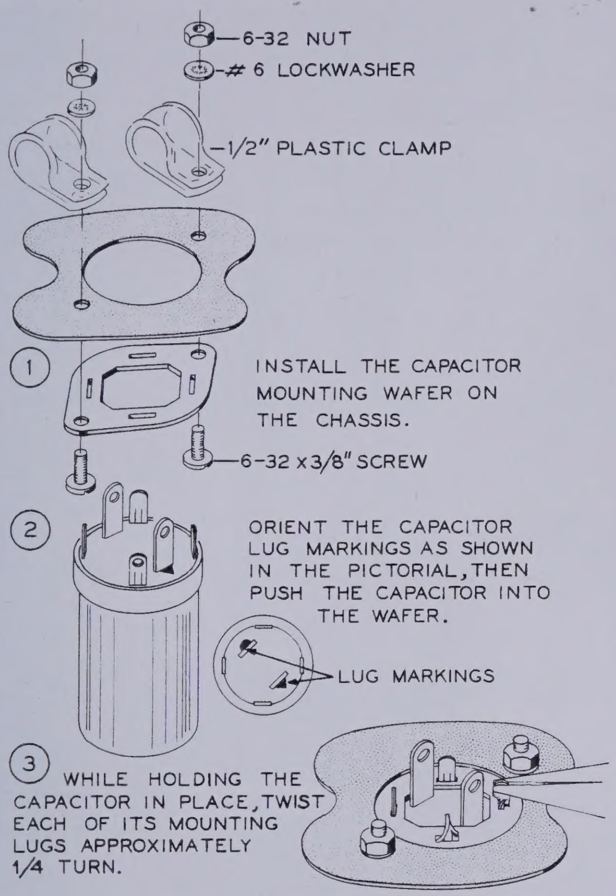
( ) Connect the red [illegible] lug 2 of [illegible]

Refer to Detail 37A [illegible] the next two steps.

( ) Connect [illegible] lug [illegible] of terminal strip [illegible]

( ) Connect [illegible] lug 1 [illegible]

( ) [illegible] through grommet [illegible] (S-1).


6-32 NUT
#6 LOCKWASHER
1/2" PLASTIC CLAMP
①
INSTALL THE CAPACITOR MOUNTING WAFER ON THE CHASSIS.
6-32 x 3/8" SCREW
②
ORIENT THE CAPACITOR LUG MARKINGS AS SHOWN IN THE PICTORIAL, THEN PUSH THE CAPACITOR INTO THE WAFER.
LUG MARKINGS
③
WHILE HOLDING THE CAPACITOR IN PLACE, TWIST EACH OF ITS MOUNTING LUGS APPROXIMATELY 1/4 TURN.

Detail 39A

(✓) Mount a metal capacitor mounting wafer at GE and a 4-lug (#2 lug ground) high voltage terminal at GD. Use 6-32 x 3/8" hardware.

(✓) C105. Again referring to Detail 39A, mount a 125 μfd 450 V twist-prong electrolytic capacitor at GE. Position the capacitor lug as shown in Pictorial 39.

(✓) C104. Mount a 125 μfd 450 V twist-prong electrolytic capacitor at GF. Position the capacitor lug as shown in Pictorial 39. Secure the capacitor by twisting each mounting lug 1/4 turn.

( ) C136A, 136B. Similarly, mount a 40-40 μfd 450 V twist-prong electrolytic capacitor at GH. Orient the capacitor lugs as shown in Pictorial 39.

( ) Connect either yellow power transformer lead to lug 2 (S-1) and the other yellow lead to lug 8 (NS) of tube socket GJ.

(✓) Connect either brown power transformer lead to lug 4 (S-1) and the other brown lead to lug 6 (S-1) of tube socket GJ.

(✓) Connect either white power transformer lead to lug 8 (S-2) and the other white lead to lug 2 (S-1) of tube socket GK.

(✓) Connect either blue power transformer lead to lug 4 (S-1) and the other blue lead to lug 6 (S-1) of tube socket GK.

(✓) R53. Cut both leads of a 100 KΩ (brown-black-yellow) 2 watt resistor to 1/2". Connect this resistor from lug 3 of terminal strip GD (NS) to lug 1 of electrolytic capacitor GE (NS).

(✓) R54. Cut both leads of another 100 KΩ (brown-black-yellow) 2 watt resistor to 1/2". Connect this resistor from lug 2 of terminal strip GD (NS) to lug 1 of electrolytic capacitor GE (NS).

(✓) Connect a length of blue high voltage wire from lug 1 of electrolytic capacitor GE (S-3) to lug 2 of electrolytic capacitor GF (S-1).

(✓) Solder lug 2 of electrolytic capacitor GE to the mounting wafer.

(✓) Connect the white-red lead extending from Breakout #15 of the harness to lug 1 of terminal strip GD (NS).

(✓) R56. Cut both leads of a 1 megohm (brown-black-green) 2 watt resistor to 3/4". Connect this resistor between lugs 1 (NS) and 3 (NS) of terminal strip GD.

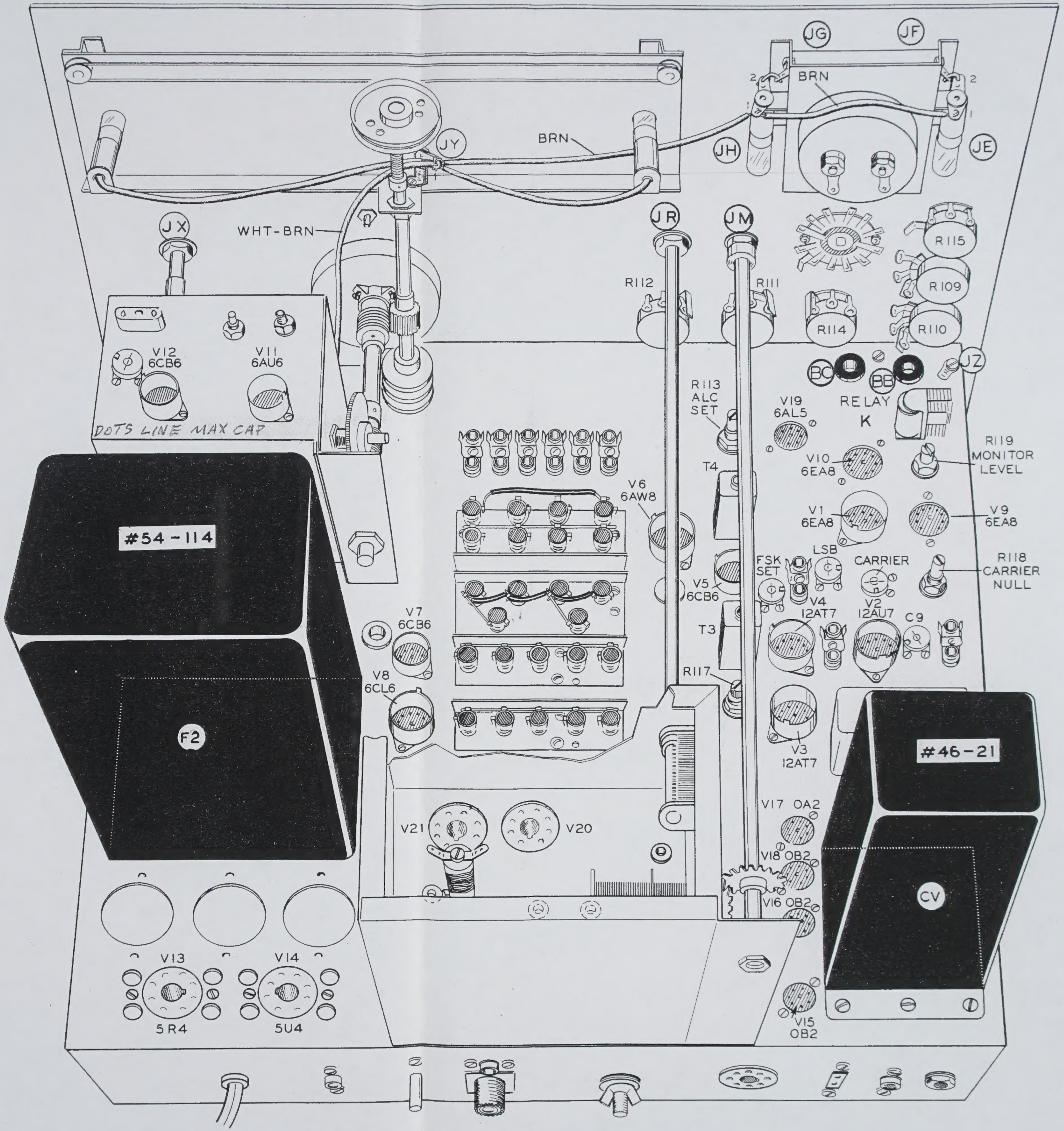
(✓) R123. Connect a 10 KΩ (brown-black-orange) 1/2 watt resistor between lugs 1 (S-3) and 2 (S-2) of terminal strip GD.

(✓) Connect the HV white-blue lead extending from Breakout #15 of the harness to lug 3 of terminal strip GD (NS).

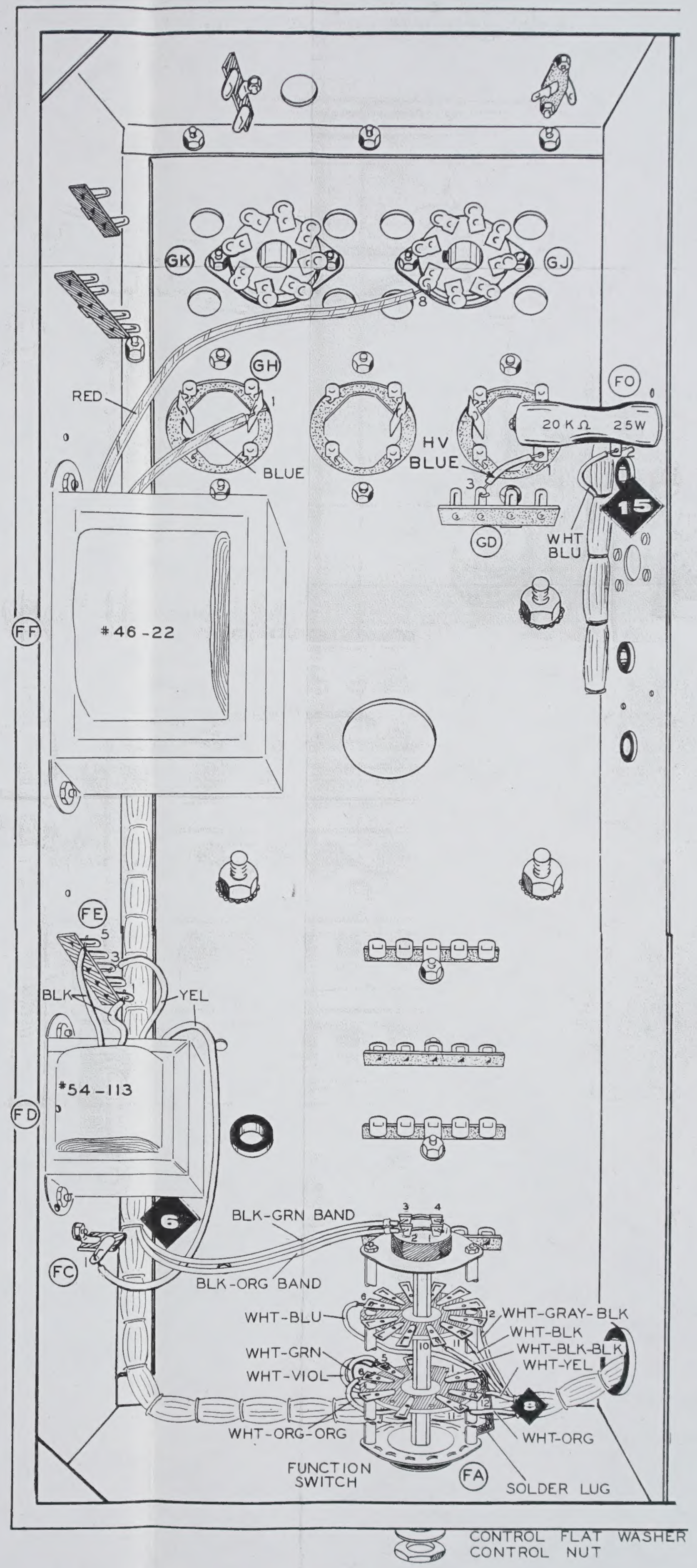
(✓) Connect the free end of the HV blue wire extending from grommet FM to lug 3 of terminal strip GD (NS).

(✓) Connect a 2" length of HV blue wire from lug 3 of terminal strip GD (NS) to lug 1 of electrolytic capacitor GF (S-1).

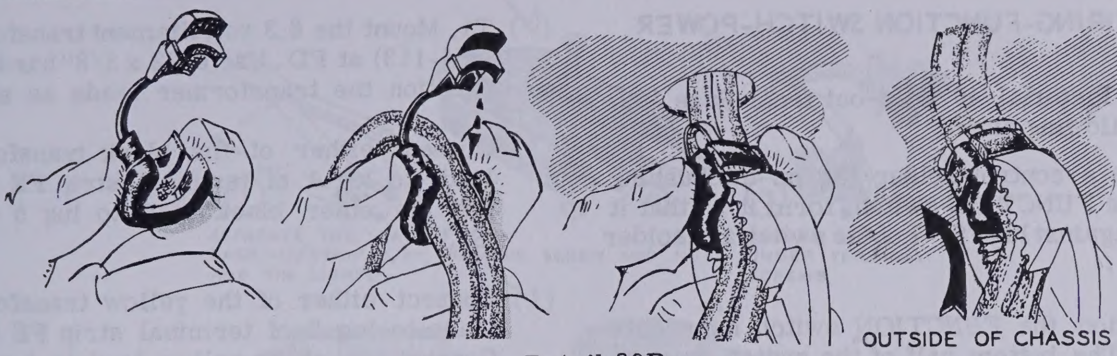
CARRIER
V18
CARRIER
NULL



Pictorial 36



Pictorial 40



Detail 39B

(✓) Connect the white-red lead extending from Breakout #3 of the harness to lug 2 of electrolytic capacitor GH (NS).

(✓) Connect the red-brown, red-yellow, and blue-red power transformer leads to lug 3 of electrolytic capacitor GH (S-3). Apply enough heat and solder to this lug to solder it to the metal mounting wafer.

(✓) R88. Cut one lead of a 100 KΩ (brown-black-yellow) 2 watt resistor to 1-1/4" and the other lead to 1/2". Pass the 1-1/4" lead through lug 2 (NS) to lug 1 (NS) of electrolytic capacitor GH. Now solder lug 2 of GH (S-3). Connect the other lead of this resistor to the ground lug nearest lug 4 of tube socket GK (S-1).

(✓) Locate the line cord without plug and the line cord strain relief. Strip and tin each lead 1/4". Approximately 2" of cord should remain inside the chassis. Referring to Detail 39B, mount them at FK.

(✓) Connect either line cord lead to lug 1 (S-3) and the other lead to lug 2 (S-3) of terminal strip FJ.

NOTE: The following two connections are made using the wires extending from grommet GB.

(✓) Connect the red wire to lug 1 of terminal strip FY (S-3).

(✓) Connect the green wire to lug 1 of terminal strip FC (NS).

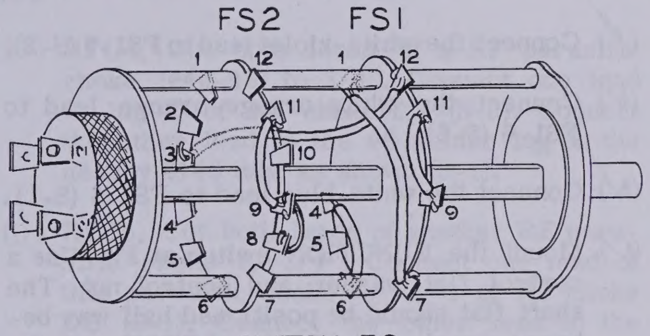
(✓) Connect the white-yellow lead from Breakout #7 of the harness to lug 1 of KEY jack FB (S-1). This is the only lead at Breakout #7.

(✓) Connect a length of bare wire between lugs 2 (S-1) and 3 (S-1) of jack FB.

FUNCTION SWITCH PREWIRING

Refer to Detail 40A for the following steps.

(✓) Locate the FUNCTION switch (#63-262) and position it as shown.



Detail 40A

NOTE: In the following steps, the lugs of the FUNCTION switch will be referred to by a combination of letters and numbers, such as FS1-5; this will mean FUNCTION switch (FS) first wafer (1) fifth lug (5).

(✓) Connect a 2" yellow hookup wire from FS1-7 (S-1) to FS1-1 (NS).

(✓) Connect a 1" yellow hookup wire from FS1-9 (S-1) to FS1-11 (NS).

(✓) Connect a 1" yellow hookup wire between FS1-4 (S-1) and FS1-6 (NS).

(✓) Connect a 1" yellow hookup wire between FS2-9 (NS) and FS2-11 (NS).

(✓) Connect a length of bare wire between FS2-8 (S-1) and FS2-9 (S-2).

(✓) Connect a 1-3/4" yellow hookup wire from FS1-12 (NS) to FS2-3 (S-1).

FINAL WIRING-FUNCTION SWITCH-POWER SUPPLY

Refer to Pictorial 40 (fold-out from Page 102) for the following steps.

(✓) Place a control solder lug on the bushing of the FUNCTION switch, form it so that it fits against lug FS1-1 of the switch and solder (S-2).

(✓) Position the FUNCTION switch near hole FA. The bottom half of the switch must be wired before it can be mounted. Be careful to route the harness leads to maintain the switch studs in the position shown.

NOTE: The following connections will be made using the harness leads from Breakout #8.

(✓) Connect the white-green lead to FS1-5 (NS).

(✓) Connect the white-violet lead to FS1-5 (S-2).

(✓) Connect the white-orange-orange lead to FS1-6 (S-2).

(✓) Connect the white-blue lead to FS2-6 (S-1).

(✓) Mount the FUNCTION switch at FA. Use a control flat washer and control nut. The shaft flat should be positioned half way between panel marks PTT and SPOT with the switch shaft fully counterclockwise.

(✓) Connect the white-yellow lead to FS1-12 (S-2).

(✓) Connect the white-orange lead to FS1-11 (S-2).

(✓) Connect the white-gray-black lead to FS2-12 (S-1).

(✓) Connect the white-black lead to FS2-11 (S-2).

(✓) Connect the white-black-black lead to FS2-10 (S-1).

(✓) Place the end of the black lead with green band from Breakout #6 through FS3-3 (NS) to FS3-4 (S-1). Now solder FS3-3 (S-2).

(✓) Place the end of the black lead with orange band from Breakout #6 through FS3-2 (NS) to FS3-1 (S-1). Now solder FS3-2 (S-2).

(✓) T1. Mount the 6.3 volt filament transformer (#54-113) at FD. Use 6-32 x 3/8" hardware. Position the transformer leads as shown.

(✓) Connect either of the black transformer leads to lug 1 of terminal strip FE (S-4), and the other black lead to lug 5 of FE (S-3).

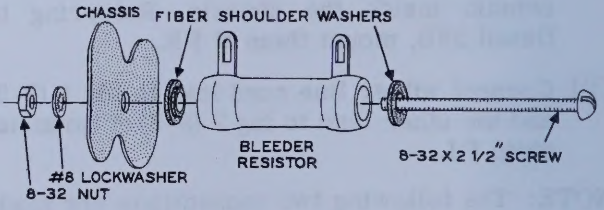
(✓) Connect either of the yellow transformer leads to lug 3 of terminal strip FE (S-2). Connect the other yellow lead to lug 1 of terminal strip FC (S-2).

(✓) L17. Mount the low voltage choke (#46-22) at FF. Use 8-32 x 3/8" hardware. Position the leads as shown.

(✓) Connect the black choke lead to lug 1 electrolytic capacitor GH (S-2).

(✓) Connect the red choke lead to lug 8 of tube socket GJ (S-2).

(✓) R55. Referring to Pictorial 40 and Detail 40B, mount the 20 KΩ 25 watt wire-wound resistor at FO. Use an 8-32 x 2-1/2" round head machine screw, two #10 fiber shoulder washers, #8 lockwasher, and an 8-32 nut. Position the lugs as shown. Do not overtighten as you may crack the resistor.

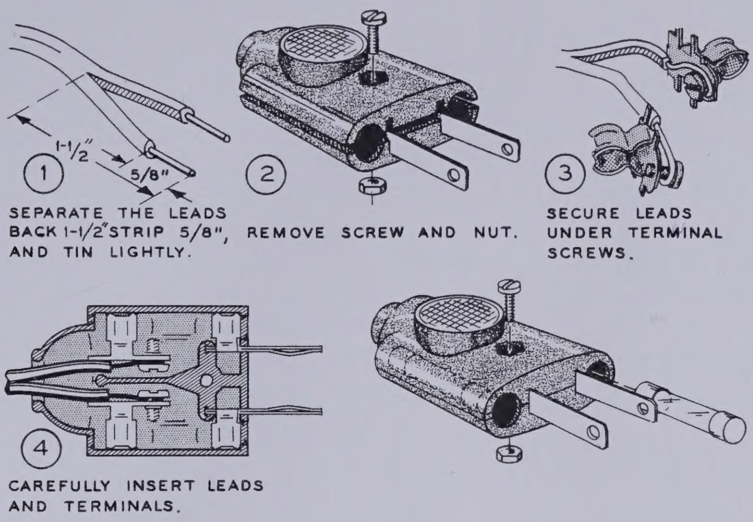


Detail 40B

(✓) Connect a 2" length of HV blue hookup wire from lug 1 of resistor FO (S-1) to lug 3 of terminal strip GD (S-6).

( ) Connect the white-blue lead extending from Breakout #15 of the harness to lug 2 of resistor FO (S-1).

(✓) Referring to Detail 40C, install the fuse plug on the free end of the line cord.


1-1/2"
5/8"
①
SEPARATE THE LEADS BACK 1-1/2" STRIP 5/8", AND TIN LIGHTLY.
②
REMOVE SCREW AND NUT.
③
SECURE LEADS UNDER TERMINAL SCREWS.
④
CAREFULLY INSERT LEADS AND TERMINALS.

Detail 40C

(✓) Reassemble the plug and insert the fuses.

NOTE: 4 ampere slow-blow fuses are supplied. If you use the AC receptacle on the rear apron, it is suggested fuses be changed to 7 ampere.

(✓) Install all tubes except the 6146's in their respective sockets as indicated by the printing on the top plate.

(✓) Install all tube shields.

(✓) Install all crystals in their respective holders as marked.

( ) Locate the two aluminum plate caps and start 6-32 x 1/4" slotted setscrews into the tapped holes on the sides of the caps. Place the caps on the plate connection of the 6146 tubes and secure with the setscrews. Use care to prevent breakage of tube cap seals.

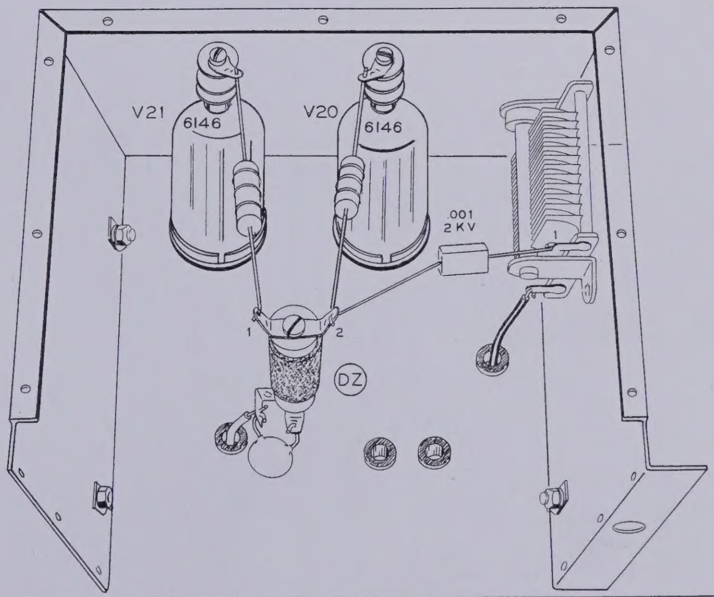
(✓) Install the 6146 tubes in their appropriate sockets.

(✓) Mount #6 solder lugs on the tops of each cap on the 6146 tubes. Use 6-32 x 1/4" screws.

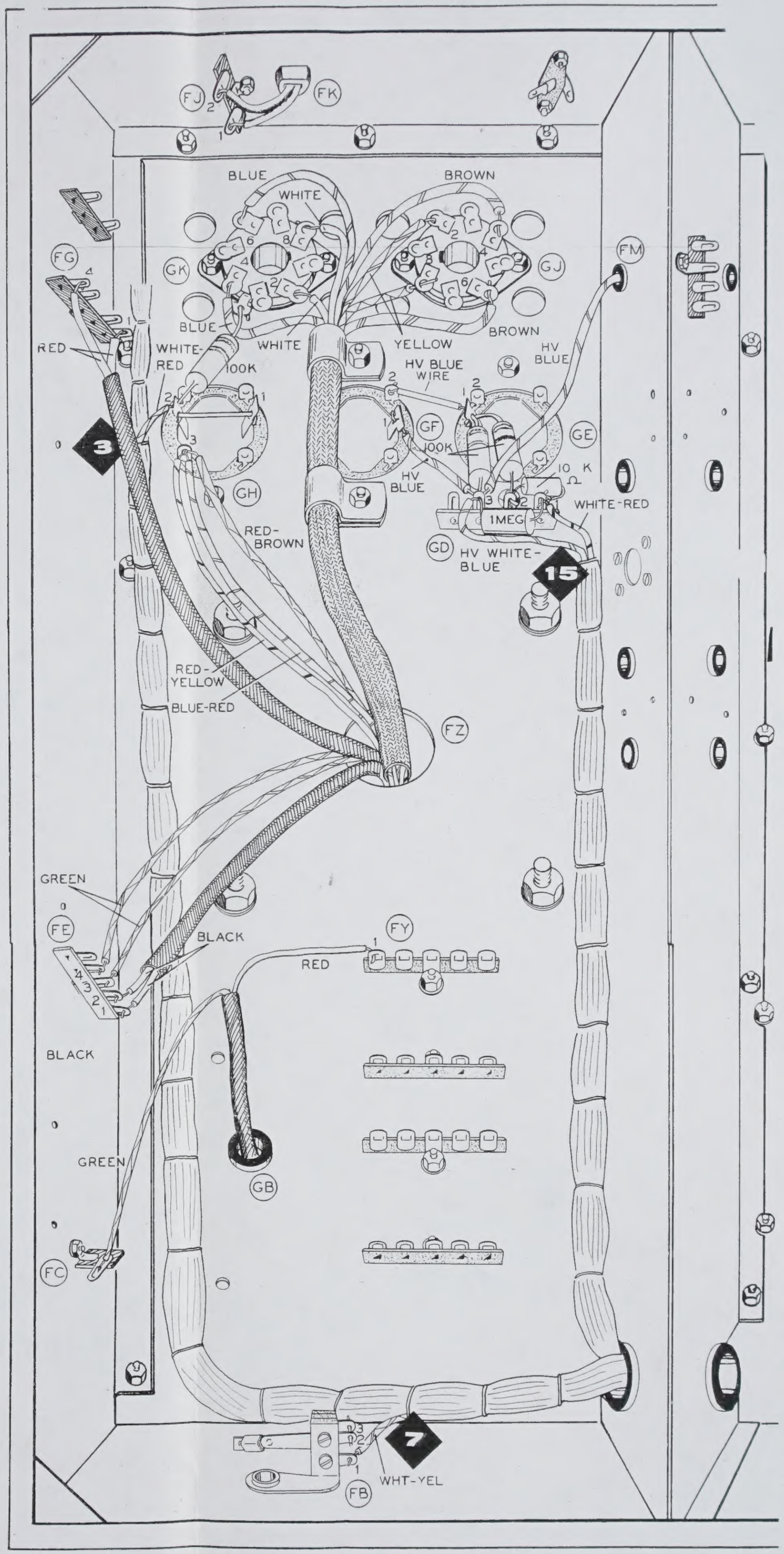
(✓) C76. Referring to Detail 40D, connect the .001 μfd 2 kv molded mica capacitor from lug 1 of the plate tuning capacitor (S-1) to lug 2 of RF choke DZ (NS). Position it to clear the loading capacitor plates when unmeshed.

(✓) RFC4. Cut both leads of a RF parasitic choke (#45-45) to 3/4". Connect one lead to lug 2 of RF choke DZ (S-2). Connect the other lead to the #6 solder lug on the nearby 6146 tube as shown (S-1).

(✓) RFC5. Cut both leads of another RF parasitic choke to 3/4". Connect one lead of this parasitic choke to lug 1 of RF choke DZ (S-1). Connect the other lead to the #6 solder lug on the nearby 6146 tube as shown (S-1).



Detail 40D



Pictorial 39

MOUNTING OF FINAL AMPLIFIER SHIELD TOP PLATE AND BLOWER

Refer to Pictorial 41 for the following steps.

(✓) Place a rubber shock mounting grommet at holes A, B, and C on the shield top plate, as shown. The shock mounting grommets are the larger flat grommets with a small hole in the center.

(✓) Mount the blower motor on the shield top plate as shown. Make sure the motor and plate are positioned to agree with the illustration. The motor will be on the topside of the installed plate with the shaft extending down through hole C. Place a #10 lockwasher, then a #10 thick flat washer on each of the 10-32 x 3/8" phillips head mounting screws and secure the motor on the shock mounts firmly, but not too tightly. Securing the screws too tightly will reduce the effectiveness of the shock mounting.

(✓) Start a 6-32 x 1/4" slotted head setscrew in the hub of the fan.

(-) Slide the fan on the motor shaft, hub first, and secure with the setscrew, with the end of the motor shaft extending 1/8" from the fan hub.

(✓) Install and secure the shield top plate and fan assembly on the final amplifier compartment. Secure with twelve #6 sheet metal screws. Check for free fan rotation before top plate installation.

(✓) Locate the line cord with the molded plug and cut 11" from the plug end as shown. Strip each lead 3/8" and tin.

(✓) Connect either line cord wire to lug 1 (S-1) and the other wire to lug 2 (S-1) of the blower motor.

(✓) Plug the line cord into AC receptacle CW in the chassis top.

KNOB INSTALLATION

Refer to Figure 21 for the following steps.

(✓) With the FREQ CONTROL set fully counterclockwise, install a 11/16" knob on its shaft with the dot at VFO on the front panel. Use an 8-32 x 1/8" Allen setscrew.

(✓) With the FUNCTION switch set fully counterclockwise, install a 1-3/4" knob on its shaft with the arrow at OFF. Use two 8-32 x 1/4" Allen setscrews.

(✓) With the BAND SELECTOR set fully counterclockwise, install a 1-3/4" knob on its shaft with the arrow at 3.5. Use two 8-32 x 1/4" Allen setscrews.

(✓) With the DRIVER TUNE capacitor set fully meshed, install a 1-1/4" knob on its shaft with the arrow at 0. Use an 8-32 x 1/4" Allen setscrew.

(✓) With the AUDIO GAIN control set fully counterclockwise, install a 1-1/4" knob on its shaft with the arrow at 0. Use an 8-32 x 1/4" Allen setscrew.

(✓) With the MODE switch fully counterclockwise, install a 1-1/4" knob on its shaft with the arrow at CW. Use an 8-32 x 1/4" Allen setscrew.

(✓) With all VOX controls set fully counterclockwise, install 11/16" knobs on each shaft with the dot at the front panel dot. Use 8-32 x 1/8" Allen setscrews in each.

(✓) With the REL PWR ADJ, SPOT LEVEL and DRIVE LEVEL controls set fully counterclockwise, install 11/16" knobs on each shaft with the dot at the front panel dot. Use 8-32 x 1/8" Allen setscrews in each.

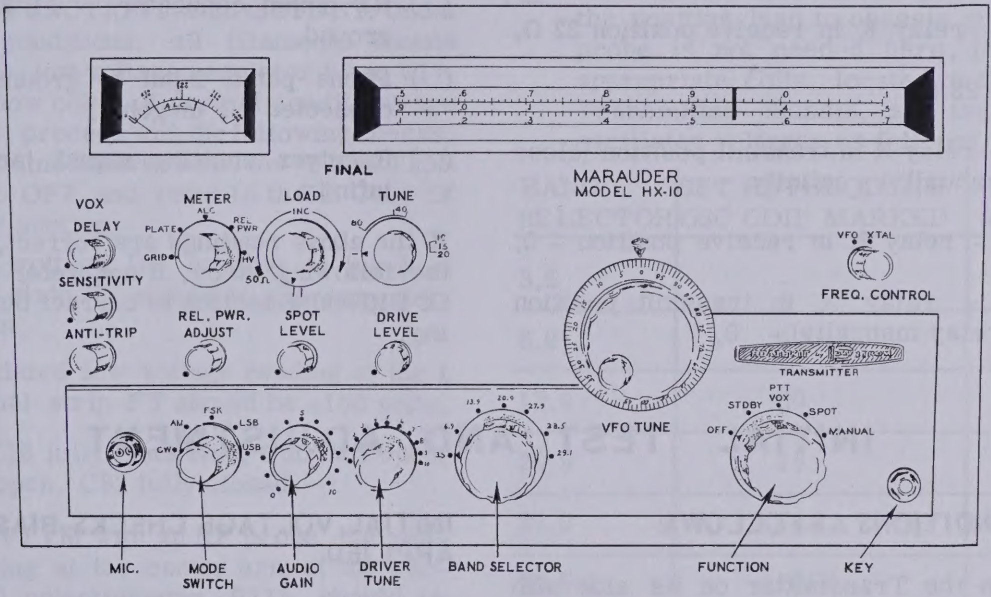
(✓) With the METER switch set fully counterclockwise, install a 1-1/4" knob on its shaft with the arrow set at GRID. Use an 8-32 x 1/4" Allen setscrew.

(✓) With the FINAL LOAD capacitor set fully meshed, install a 1-1/4" knob on its shaft with the arrow positioned at the lower left panel mark. Use an 8-32 x 1/4" Allen setscrew. Check the rotation of this shaft to observe if, in its fully clockwise position, the arrow points to the lower right panel mark. Adjust as necessary.

(√) With the FINAL TUNE capacitor set fully meshed, install a 1-1/4" knob on its shaft with the arrow set at the panel mark to the left and below the 80 meter indication. Use an 8-32 x 1/4" Allen setscrew.

(√) Install a red plastic knob on the Monitor Output Control on the rear apron.

This completes the assembly of your HEATHKIT HX-10 Transmitter.



FRONT PANEL CONTROLS

Figure 21

INITIAL INSPECTION AND CHECKS

Carefully examine the wiring for unintentional shorts. Be sure that all wire clippings and solder splashes are removed from the Transmitter, and that all mechanical connections are secure.

NOTE: The following readings were measured with an 11 megohm input VTVM. Refer to the assembly Pictorials to locate measurement points in the Transmitter.

OHMMETER CHECKS-NO POWER APPLIED

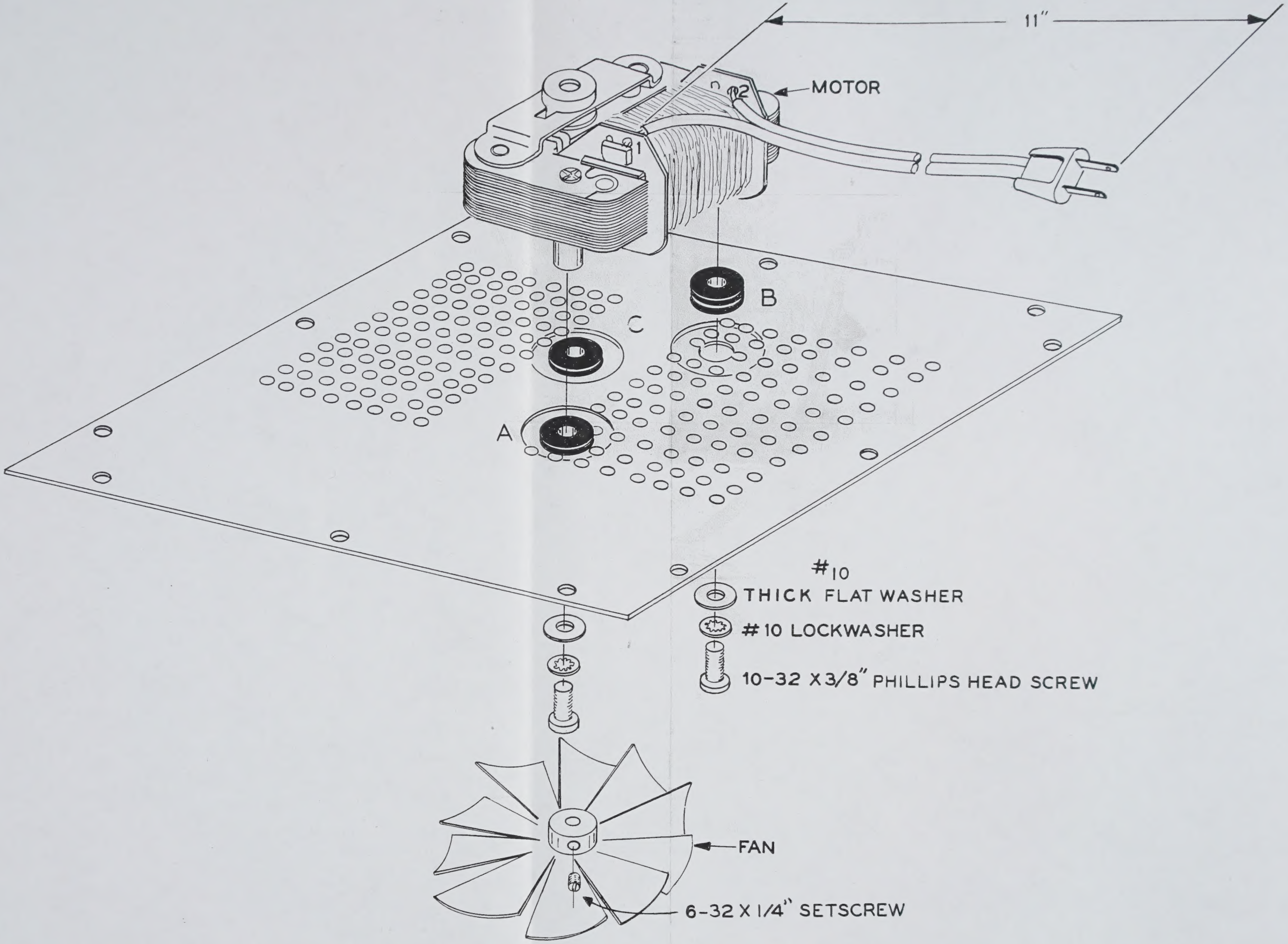
(√) Do not plug the line cord into the power source. Place the FUNCTION switch in the STDBY position. Measure the resistance from each side of the line cord to chassis ground. It should read infinity.

(√) Place the negative lead of a VTVM on the positive (→|+) lead of diodes CR5 and then CR6 (shown on Pictorial 6, Page 41, terminal strip FG). Connect the positive lead of the VTVM to chassis ground. The reading should be approximately 25 Ω.

(√) Place the negative lead of the VTVM on the negative lead of diodes CR5 and 6. Connect the positive lead of the VTVM to chassis ground. After a few seconds, the resistance reading should be approximately 40 KΩ.

(√) Connect the negative lead of the VTVM to chassis ground. Place the positive lead on lug 8 of tube socket V14. After a few seconds, the resistance reading should be approximately 18 KΩ.

(√) Leave the negative lead of the VTVM connected as in the previous step. Place the positive lead on lug 8 of tube socket V13. After a few seconds, the resistance reading should be approximately 180 KΩ.

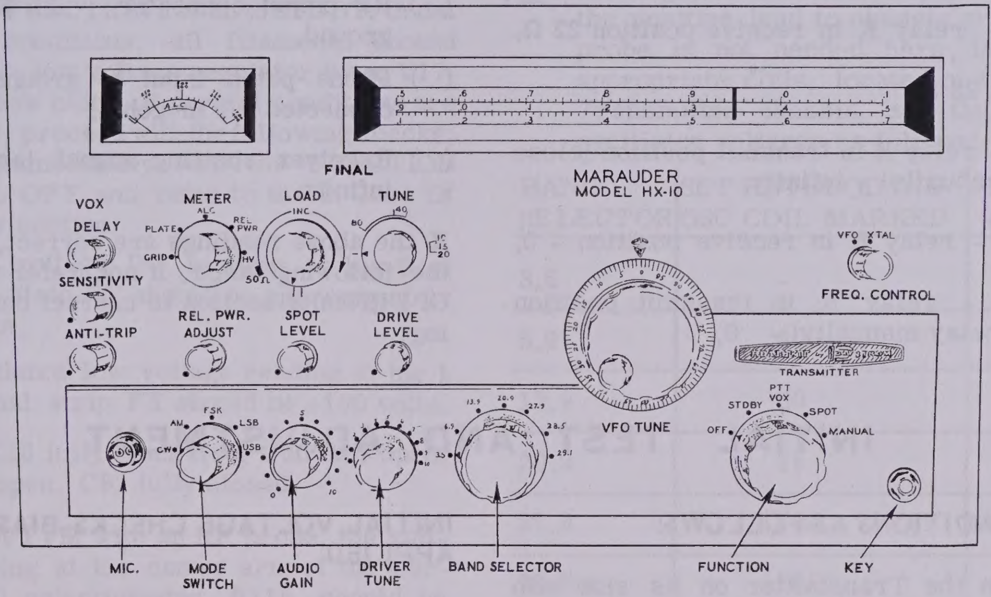


Pictorial 41

(✓) With the FINAL TUNE capacitor set fully meshed, install a 1-1/4" knob on its shaft with the arrow set at the panel mark to the left and below the 80 meter indication. Use an 8-32 x 1/4" Allen setscrew.

(✓) Install a red plastic knob on the Monitor Output Control on the rear apron.

This completes the assembly of your HEATHKIT HX-10 Transmitter.



FRONT PANEL CONTROLS

Figure 21

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Carefully examine the wiring for unintentional shorts. Be sure that all wire clippings and solder splashes are removed from the Transmitter, and that all mechanical connections are secure.

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(✓) Place the negative lead of a VTVM on the positive (▸|+) lead of diodes CR5 and then CR6 (shown on Pictorial 6, Page 41, terminal strip FG). Connect the positive lead of the VTVM to chassis ground. The reading should be approximately 25 Ω.

(✓) Place the negative lead of the VTVM on the negative lead of diodes CR5 and 6. Connect the positive lead of the VTVM to chassis ground. After a few seconds, the resistance reading should be approximately 40 KΩ.

(✓) Connect the negative lead of the VTVM to chassis ground. Place the positive lead on lug 8 of tube socket V14. After a few seconds, the resistance reading should be approximately 18 KΩ.

(✓) Leave the negative lead of the VTVM connected as in the previous step. Place the positive lead on lug 8 of tube socket V13. After a few seconds, the resistance reading should be approximately 180 KΩ.

(✓) ACCESSORY SOCKET, resistance to chassis ground.

Lug 1 - 1 megohm.
Lug 2 - relay K in transmit position (close relay manually) - 1 to 3 Ω, depending on setting of R119.

Lug 2 - relay K in receive position 22 Ω.

Lug 3 - 22 Ω

Lug 4 - relay K in transmit position (close relay manually) - infinity.

Lug 4 - relay K in receive position - 0.

Lug 5 - relay K in transmit position (close relay manually) - 0.

Lug 5 - relay K in receive position - 100 - 120 KΩ.

Lug 6 - 0.

Lug 7 - infinity.

Lug 8 - infinity.

( ) RF output connector - 11 KΩ to chassis ground.

( ) Phone patch input to ground, mike disconnected - 1 megohm.

( ) Receiver spotting signal jack to ground-infinity.

If the above readings are correct, proceed with the following steps. If not, refer to the In Case Of Difficulty section to correct before proceeding.

INITIAL TEST AND ADJUSTMENT

SET UP CONDITIONS AS FOLLOWS:

(✓) Position the Transmitter on its side with the power transformer down.

(✓) For the following tests, remove the 5R4 high voltage rectifier tube, V13, and the 5U4 low voltage rectifier tube, V14, from their sockets.

(✓) Insert a key plug in the KEY jack (contacts open).

Set Front Panel Controls As Follows:

FUNCTION	OFF
BAND SELECTOR	3.5
DRIVER TUNE	Counterclockwise
MODE	CW
ANTI-TRIP	Counterclockwise
SENSITIVITY	Clockwise
DELAY	10 o'clock
SPOT LEVEL	Counterclockwise
DRIVE LEVEL	Clockwise

(✓) Plug the line cord plug into a 117 volt 50/60 cps AC receptacle. Under normal conditions (FUNCTION switch still in OFF position), the filaments of tube V11 and V12 will light.

INITIAL VOLTAGE CHECKS-BIAS ONLY APPLIED

NOTE: All voltage measurements are with respect to chassis ground, unless otherwise indicated. Please read the following steps through carefully before performing them.

112

(✓) 117 volts AC should appear between lugs 1 and 5 of terminal strip FE. See Pictorial 39.

(✓) 6.3 volts AC should appear on lug 1 of terminal strip FC.

(✓) Turn the FUNCTION switch to STDBY. Under normal conditions, the remaining tube filaments should light and the negative bias voltage at lug 1 of terminal strip FW should be approximately -150 volts DC. If this reading is normal, proceed with the following steps; if not, refer to the In Case Of Difficulty section on Page 134.

ok

(✓) Check for -142 volt bias voltage at lug 5 of tubes V20 and V21.

(✓) Check for -70 volt bias voltage at lug 7 of tube V6A and lug 2 of tube V8.

(✓) If these voltages are not available, see the In Case Of Difficulty section before proceeding.

INITIAL VOLTAGE CHECKS-BIAS AND LOW VOLTAGE APPLIED

✓(✓) Turn the FUNCTION switch to OFF.

✓(✓) Reinstall the 5U4 low voltage rectifier tube, V14.

✓(✓) Turn the FUNCTION switch to STDBY. Under normal conditions, all filaments should light. The low voltage regulator tube, V17, should show color. If normal conditions are observed, proceed with the following checks. If not, immediately turn the FUNCTION switch to OFF and refer to the In Case Of Difficulty section.

✓(✓) The low voltage DC reading at lug 5 of terminal strip FY should be approximately +325 volts.

✓(✓) The regulated low voltage reading at lug 1 of terminal strip FY should be +150 volts.

(✓) Rotate R118 fully clockwise, C80 half open, C91 half open, C92 fully closed.

(✓) Using a VTVM with an RF probe, the voltage reading at the center arm of the Carrier Null potentiometer, R118, should be approximately -2.7 volts. This indicates the carrier oscillator is functioning and can be heard on a receiver tuned to 4990 kc.

(✓) Using the same RF probe, measure the voltage at the center arm of the Sideband Balance potentiometer, R117. With the MODE switch in the CW position, it should be approximately -.6 volt. With the MODE switch in the USB position, it should be approximately -.7 volt. These readings depend upon the setting of R117 and can vary proportionately higher. R117 should be adjusted to obtain these readings by switching the MODE switch from LSB to USB and alternately adjusting R117 until approximately equal voltages are obtained. The reading in the LSB position will be the same in the CW and AM positions.

NOTE: In the CW, AM, or LSB positions, the lower sideband oscillator operates at 13,990 kc and can be heard in a receiver tuned to this frequency. When the MODE switch is in the USB position, the upper sideband oscillator operates at 4010 kc and can be heard in a receiver tuned to this frequency. It is important at this time to know that the carrier oscillator and both sideband oscillators are operating. Exact settings of these frequencies and levels will be done later.

Refer to Figure 22 for the following steps.

8/2

(✓) Use an 11 megohm input VTVM (on appropriate scale) for the following steps. Place the negative lead in test point jack TP and the positive lead to chassis ground. An RF probe is not needed here. By tuning the appropriate coils, located on the top of the Transmitter chassis, set the heterodyne oscillator voltages as follows:

BAND SELECTOR	SET HETERODYNE OSC COIL MARKED	FOR KEY DOWN
3.5	-	0 volts
6.9	40	2.5 volts
13.9	20	3.0 volts
20.9	15	3.0 volts
27.9	10A	3.0 volts
28.5	10B	4.5 volts
29.1	10C	2.5 volts

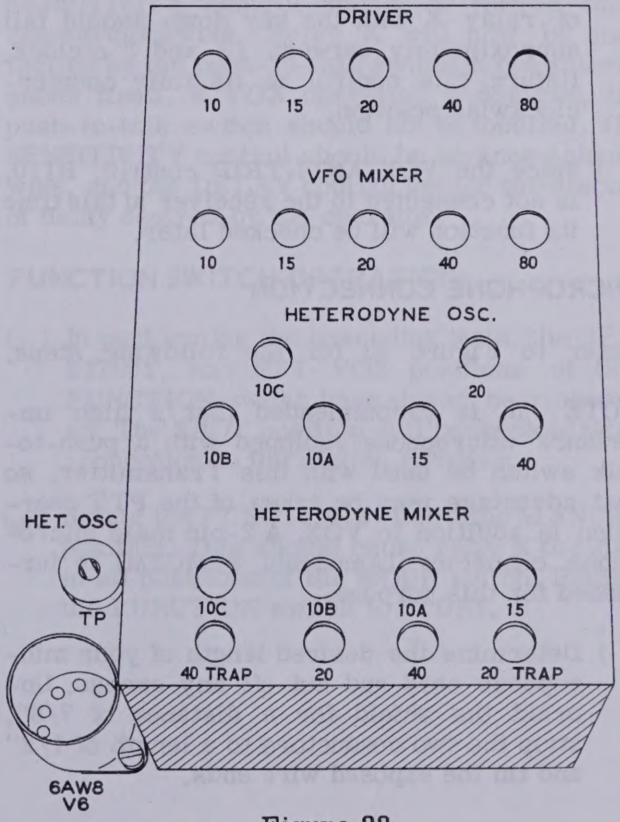


Figure 22

NOTE: If normal operation is observed, proceed with the following steps. If not, refer to the In Case Of Difficulty section.

(✓) Return the BAND SELECTOR to 3.5 and remove the meter leads.

CW-VOX CONTROL FUNCTIONS

(✓) With the MODE switch at CW and the FUNCTION switch at PTT-VOX, close the key. If operation is normal, relay K will close upon keying. When the key is opened, relay K should stay closed for a short length of time, depending upon the setting of VOX DELAY control, R115. Turning the VOX DELAY control clockwise should increase this time to slightly more than 1-1/2 seconds. Turning this control counterclockwise decreases the delay time to its minimum value. This indicates normal action of the VOX DELAY control.

(✓) With the VOX SENSITIVITY control, R109, set to approximately 3 o'clock, relay K should close when the Transmitter is keyed. Rotating this control counterclockwise with the key still closed should cause relay K to open (return to its receive position). Check for normal operation of this control by rotating it and noting that the normal closing of relay K with the key down should fall approximately between 12 and 3 o'clock. Return this control to its fully counterclockwise position.

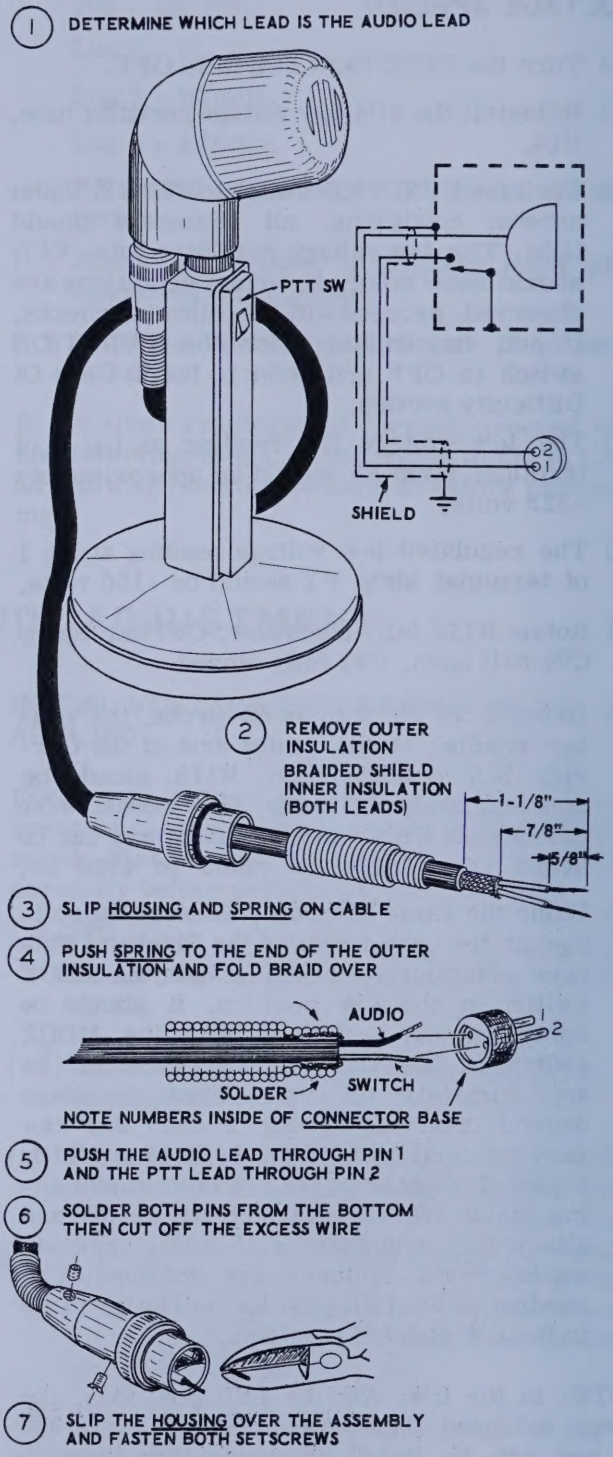
( ) Since the VOX ANTI-TRIP control, R110, is not connected to the receiver at this time its function will be checked later.

MICROPHONE CONNECTION

Refer to Figure 23 for the following steps.

NOTE: It is recommended that a high impedance microphone equipped with a push-to-talk switch be used with this Transmitter, so that advantage may be taken of the PTT operation in addition to VOX. A 2-pin male microphone connector (Amphenol 80MC2M) is furnished for this purpose.

( ) Determine the desired length of your microphone cord and cut off any excess. Unbraid the shield for a distance of 7/8", strip the two conductors to a length of 1/2" and tin the exposed wire ends.



① DETERMINE WHICH LEAD IS THE AUDIO LEAD

② REMOVE OUTER INSULATION
BRAIDED SHIELD
INNER INSULATION
(BOTH LEADS)

③ SLIP HOUSING AND SPRING ON CABLE

④ PUSH SPRING TO THE END OF THE OUTER INSULATION AND FOLD BRAID OVER

NOTE NUMBERS INSIDE OF CONNECTOR BASE

⑤ PUSH THE AUDIO LEAD THROUGH PIN 1 AND THE PTT LEAD THROUGH PIN 2

⑥ SOLDER BOTH PINS FROM THE BOTTOM THEN CUT OFF THE EXCESS WIRE

⑦ SLIP THE HOUSING OVER THE ASSEMBLY AND FASTEN BOTH SETSCREWS

Figure 23

( ) Disassemble the microphone connector by removing the two setscrews in the connector body. This will release the plug, body, and spring. Place the spring on the mike cord with the small end toward the plug. Place the body on the mike cord with the large end toward the plug.

( ) Referring to Figure 23, connect the audio lead from your microphone to pin 1 of the mike connector plug. Solder and remove any excess lead length. Connect the switching lead from your microphone to pin 2 of the mike connector plug. Solder and remove any excess length.

( ) Now fold the shield braid back over the cable body. Run the spring down over the braid and lightly solder the end of the spring to the braid. Slide the body down over the spring and the plug. Position the small hole in the body with the small hole in the plug. Secure the body and the plug with the small setscrew. Holding the spring in place, secure the larger setscrew.

This completes the microphone connection.

Examine the connector and determine that the microphone output lead is not grounded when the push-to-talk switch is not depressed. This audio lead must remain open (ungrounded) so that when VOX operation is used it will have a constant supply of audio to activate the VOX control circuit. If your audio lead is grounded, the switch contact performing the ground operation can be disconnected in this position so that audio is available regardless of whether push-to-talk or VOX operation is desired.

AM-SSB-PTT-VOX CONTROL FUNCTIONS

NOTE: For the following steps it is assumed that a microphone with the push-to-talk feature is used. If push-to-talk is not available, pin 2 of the microphone receptacle may be shorted to ground to perform the following three steps.

(✓) Plug the microphone in with the push-to-talk switch in the open position.

(✓) Place the VOX SENSITIVITY control fully counterclockwise.

(✓) Place the MODE switch in the AM position. Depress the microphone button. This should close relay K, indicating proper push-to-talk operation. Move the MODE switch to the LSB and USB positions. Making the same check, you should obtain similar results.

(✓) Remove the jumper from pin 2 if used.

(✓) Turn the VOX SENSITIVITY control, R109, fully clockwise and talk into the microphone. Check with the MODE switch in AM, LSB, and USB. In all positions, talking into the microphone should close relay K and the delay time should be governed by the setting of the VOX DELAY control.

NOTE: If any of the above tests indicate other than normal operation, refer to the In Case Of Difficulty section. If normal operation is experienced, proceed with the following steps.

If push-to-talk operation is desired, the VOX SENSITIVITY control should be turned fully counterclockwise. Relay K will now be controlled by the push-to-talk switch in the microphone itself. If VOX operation is desired, the push-to-talk switch should not be touched. The SENSITIVITY control should be advanced clockwise, and the DELAY control set for the amount of delay desired by the operator.

FUNCTION SWITCH OPERATION

✓ ( ) In performing the preceding tests, the OFF, STDBY, and PTT-VOX positions of the FUNCTION switch have already been checked. The SPOT position will be checked after connection to the station receiver.

(✓) Rotate the FUNCTION switch to the MANUAL position. This should cause relay K to close in all positions of the MODE switch. Return the FUNCTION switch to STDBY.

ACCESSORY SOCKET VOLTAGE MEASUREMENTS

Refer to Figure 24 when making these measurements (MODE switch in CW position).

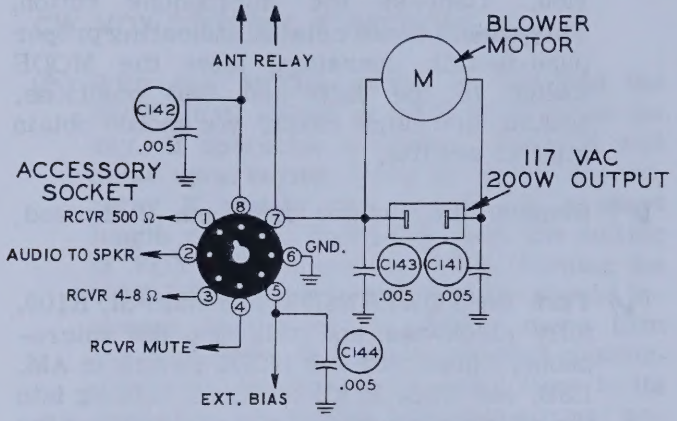


Figure 24

(☑) Lug 1 to chassis ground - 0 V DC.

(☑) Lug 2 to chassis ground - 0 V DC.

(☒) Lug 3 to chassis ground - 0 V DC.

(☒) Move the FUNCTION switch to PTT-VOX.

(☒) Lug 4 to chassis ground - key down, 0 V DC - key up, 0 V DC.

(☒) Lug 5 to chassis ground - Key up, -140 volts, Key down, -0 V DC. This is the external cutoff bias connection.

(☑) Lug 6 - This is an additional ground connection - 0 V DC.

(☑) Lugs 7 and 8 - 117 volts AC, keyed by the closing of relay K. These are antenna relay control connections. Leakage voltage to ground-approximately 50 volts AC.

AC SOCKET VOLTAGE

(☒) Between lugs 1 and 2 - 117 volts AC, switched on and off by the OFF and STDBY positions of the FUNCTION switch.

(☒) Return the FUNCTION switch to STDBY.

VFO CALIBRATION

VFO MECHANICAL ADJUSTMENTS

The VFO tuning shaft and driving gears as well as pulley shaft and driving gears are in place at this time. The following explanation is given in order to conserve time and to help in achieving the desired smooth operation.

The driven gears are not meant to be fully meshed but rely on spring tension to hold their teeth against the worm gear teeth regardless of the direction of rotation. The phenolic gear should be adjusted closer to its worm gear than the pulley drive gear to its worm, but neither must be tight against its worm gear. This results only in a binding action. The pulley drive shaft must be aligned in its bushings in order to rotate freely. Small movement of the upper bushing through which this shaft passes accomplishes this alignment. The pulley drive gear should mesh with its worm gear but must always be positioned above the center of the VFO tuning shaft for proper action.

If any erratic operation of the VFO or pointer drive is noted in the following alignment, it will more than likely be traceable to these mechanical adjustments. It is suggested you spend as much time as is necessary on this adjustment to bring the desired results. Always recheck the horizontal motion of the VFO tuning shaft after installation in the cabinet.

VFO ALIGNMENT

The VFO tunes from 4900 to 5500 kc. When the VFO knob is fully clockwise and the dial pointer is at its extreme right-hand calibration mark, the frequency of the VFO is 4900 kc. When the VFO tuning knob is fully counterclockwise, and the dial pointer in its extreme left-hand calibration mark, the frequency of the VFO is 5500 kc. To calibrate the VFO it is necessary to use a receiver tuning this range, or, harmonics of these frequencies. If such a receiver is available and is equipped with a crystal calibrator, it alone may be used for VFO calibration.

If a receiver covering this range is not available, it is possible to calibrate the VFO by listening to the output of driver stage V8. In

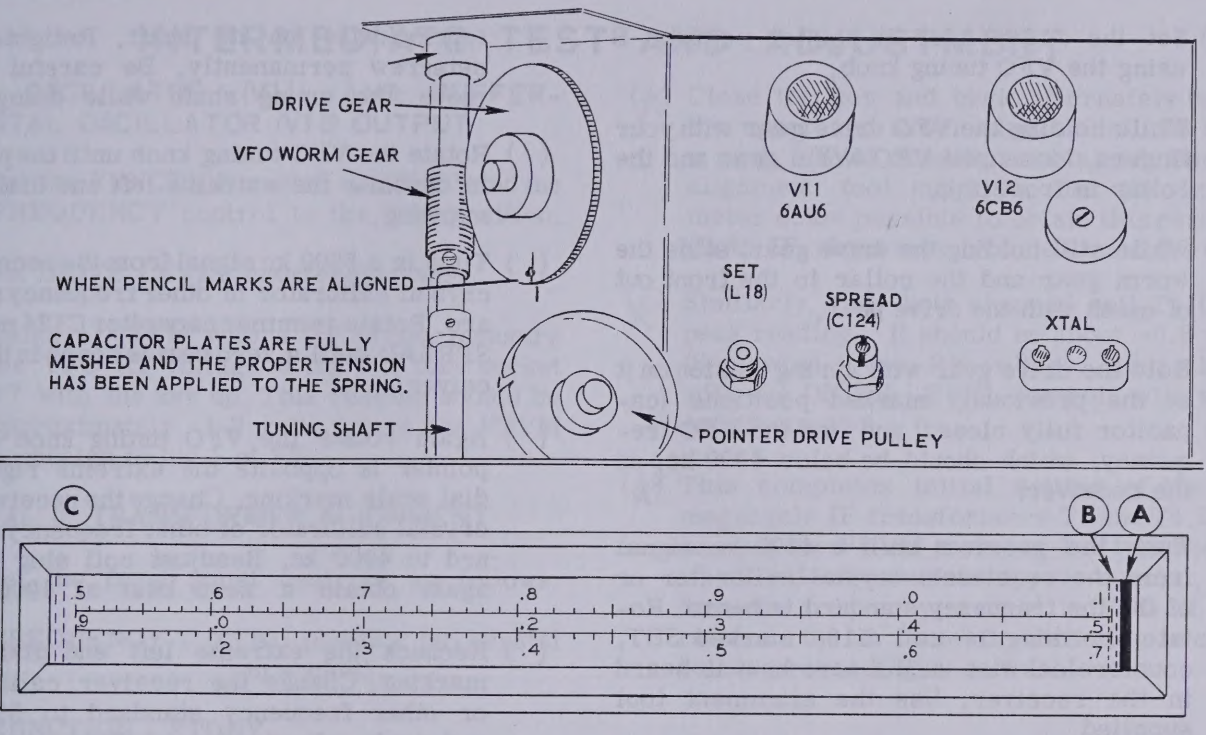


Figure 25

this case, calibration may be delayed until just prior to final neutralization using the technique described below but substituting band edge frequencies for VFO frequencies. Do not forget in this event when you listen to the driver signal at 4100 kc the VFO is actually tuned to 4900 kc and the tuning slug of L18 is used to set this frequency. When you listen to the driver signal at 3500 kc the VFO is actually tuned to 5500 kc and trimmer capacitor C124 is used to set the spread at this end of the dial scale. It may be necessary to couple the driver signal to the receiver input terminals in order to hear it. This may be done by loosely wrapping a length of insulated wire around tube V8 and connecting the end to the receiver input terminals.

Frequency standards of the BC-221 or LM series or a 100 kc crystal calibrator make excellent calibrating devices. If this type of standard is not available, you may wish to purchase a 4900 kc and a 5500 kc crystal for use in the transmitter crystal oscillator, V12, to mark the upper and lower VFO calibration limits.

If a frequency standard is used, let the Transmitter and the frequency standard warm up for at least 1 hour or more. This will allow all components and circuits to stabilize.

When the VFO enclosure was assembled, the fully open and closed positions of the tuning capacitor were marked on the outside of the VFO enclosure and on the phenolic gear. The fully open and closed positions of the VFO trimmer capacitor, C124, were also marked. Check the full rotation of the main VFO tuning knob and again be certain that when the VFO knob is in the fully clockwise position the pointer is at the extreme right end of the dial. Turn the VFO knob fully counterclockwise and be sure that the pointer is at the left end of the dial.

Refer to Figure 25 for VFO calibration.

( ) Rotate the main VFO tuning knob clockwise until the stop is contacted (pointer at position A).

( ) Rotate the VFO tuning knob so the pointer is at the extreme left end of the dial (pointer at position C). Again rotate the VFO tuning knob until the pointer is at the right end of the dial. Any overtravel of the pointer should be adjusted equally at both ends of the scale by small movement of the dial drum pulley. Be careful to maintain the spring tension.

( ) Set trimmer capacitor C124 (marked SPREAD) half open.

( ) Do not turn the slug of coil L18 as yet.

( ) Set the dial pointer at pointer position B using the VFO tuning knob.

( ) While holding the VFO drive gear with your fingers, loosen the VFO worm gear and the collar in front of it.

( ) While still holding the drive gear, slide the worm gear and the collar to the front out of mesh with the drive gear.

( ) Hold the drive gear with spring tension on it at the previously marked positions (capacitor fully closed) and find the VFO frequency, which should be below 4900 kc, on the receiver.

( ) Tune the receiver until a 4900 kc signal from the receiver's crystal calibrator or of the the frequency standard is heard. Rotate the slug of coil L18, marked SET, counterclockwise until a zero beat is heard in the receiver. Use the alignment tool supplied.

( ) If the signal cannot be heard in the receiver, use a length of insulated wire with one end wrapped around V12 and couple the other end to the receiver antenna terminal.

( ) Slowly move the VFO drive gear until the absolute lowest frequency is indicated in the receiver, indicating complete full mesh of the tuning capacitor.

NOTE: The following three steps are critical adjustments and must be done accurately.

( ) Carefully hold the VFO drive gear at this position (zero beat in the receiver) and turn the VFO worm gear clockwise seven turns into the drive gear, then temporarily secure the worm gear to its shaft.

( ) Slide the collar in front of the worm gear back against it and tighten it with the setscrew in the same plane as that of the worm gear. Release the drive gear since the worm gear will hold it in place.

( ) Viewing the tuning shaft from the front, loosen the worm gear setscrew and manually turn the worm gear nine turns counterclockwise on its shaft. Retighten the setscrew permanently. Be careful not to move the tuning shaft while doing this.

( ) Rotate the VFO tuning knob until the pointer is opposite the extreme left end dial scale marking.

( ) Tune in a 5500 kc signal from the receiver's crystal calibrator or other frequency standard. Rotate trimmer capacitor C124 marked SPREAD until a zero beat is heard in the receiver.

( ) Again rotate the VFO tuning knob so the pointer is opposite the extreme right end dial scale marking. Change the receiver and crystal calibrator or other frequency standard to 4900 kc. Readjust coil slug L18 to again obtain a zero beat at 4900 kc.

( ) Recheck the extreme left end dial scale marking. Change the receiver, calibrator, or other frequency standard to 5500 kc and again adjust trimmer C124 to obtain a zero beat.

NOTE: The adjustment of coil slug L18 and trimmer capacitor C124 interact. By alternately adjusting each, a point will be reached where the band edges will be directly under the dial pointer. Intermediate dial scale markings may be checked for accuracy by the same zero beat method to complete the calibration process.

Because of the heterodyne process of VFO control used in this Transmitter, the output frequencies will be in accordance with the BAND SELECTOR markings and one appropriate dial scale reading. For instance, if the band in use is marked "3.5" or "28.5," the dial scale reading used is that one beginning with ".5" at the extreme left end. If the "6.9," "13.9", "20.9", or "27.9" bands are used, the dial scale reading used is that one beginning with ".9" at the extreme left end. If the "29.1" band is used, the scale beginning with ".1" at the extreme left is used. The VFO is calibrated for only one band of frequencies (4900 kc to 5500 kc), and all other changes are made in the heterodyne portions of the Transmitter. Therefore, one VFO calibration will be accurate for all seven bands.

INTERMEDIATE TEST AND ADJUSTMENT

VFO OSCILLATOR (V11) AND BUFFER-CRYSTAL OSCILLATOR (V12) OUTPUT

(✗) Set the FUNCTION switch to STDBY and the FREQUENCY control to the VFO position.

(✗) Set DRIVE LEVEL counterclockwise.

(✗) Using a VTVM with a RF probe, measure the VFO RF voltage at lug 1 of tube socket V7 with the key up. This reading should be approximately -1.2 volt. Leave the VTVM connected to lug 1 of V7.

INITIAL IF TRANSFORMER ALIGNMENT

(✓) Set the front panel controls as follows:

- FREQUENCY - XTAL position (no crystal in socket).
- FUNCTION - STDBY.
- BAND SELECTOR - 3.5.
- DRIVER TUNE - Counterclockwise.
- AUDIO GAIN - Counterclockwise.
- MODE - CW.
- DRIVE LEVEL - Clockwise.
- VOX SENSITIVITY - Clockwise.
- VOX ANTI-TRIP - Counterclockwise.
- VOX DELAY - 12 o'clock.
- METER SWITCH - GRID
- VFO - 3.5 megacycles.

(✗) Insert the key plug in the KEY jack, key open.

(✗) Close the key and begin alternately tuning the upper and lower slug of coil T3 until a peak VTVM reading is obtained. Use the alignment tool supplied. Use the lowest meter scale possible to obtain this reading. (Both IF slugs may be tuned from the top.)

(✗) Similarly, tune both slugs of coil T4 for a peak reading. It should be about -0.8 volt. 0.72 (Somewhat lower RF voltage, controllable with the DRIVE LEVEL control, will work satisfactorily.)

(✗) This completes initial setting of the 9.0 megacycle IF transformers T3 and T4. Disconnect the VTVM from lug 1 of tube socket V7. If all adjustments appear normal, return the frequency control to VFO. If not, refer to the In Case Of Difficulty section before proceeding.

INITIAL SETTING OF NEUTRALIZING CAPACITOR

(✗) Turn the FUNCTION switch to OFF.

( ) Turn the unit on its side and locate the neutralizing capacitor, C58, under the chassis on the amplifier shield wall. Install a small red knob on the capacitor shaft. Set the rotor plates to approximately 1/2 of full mesh. This setting will be approximately correct. A more accurate neutralizing check will be made later.

(✗) Turn the FUNCTION switch to STDBY.

NOTE: The balance of Transmitter alignment will be accomplished using the "S" meter reading of a general coverage receiver according to the following table. In each step, tune for a maximum "S" meter reading until the Transmitter begins to indicate grid current. At this

2.
14 ⟌45.0
42
30

point tune for maximum grid current using the DRIVE LEVEL control to keep the meter pointer on scale. Turn the METER switch to the GRID position, the FUNCTION switch to PTT-VOX. Open the key between readings. A short length of wire at the receiver antenna terminal should provide sufficient coupling.

	SET BAND TO	SET DRIVER TUNE TO	SET VFO TO	TUNE RCVR TO	SET HET MIX COIL MAX	SET VFO MIX COIL MAX	SET DRIVER COIL TO MAX.
	3.5	2	3.5 mc	3.5 mc	-	80	80
	6.9	1-1/2	7.0 mc	7.0 mc	40	40	40
*	13.9	1	14.0 mc	14.0 mc	20	20	20
**	20.9	4	21.0 mc	21.0 mc	15	15	15
	28.5	3-1/2	28.5 mc	28.5 mc	10B	10	10
	27.9	Tune for Max Grid reading	28.0 mc	28.0 mc	10A	-	-
	29.1	Tune for Max Grid reading	29.1 mc	29.1 mc	10C	-	-

*( ) Repeak IF transformers T3 and T4 observing maximum transmitter grid current readings on 20 meters.

( ) Tuning of the 40 and 20 meter traps will be done after final null settings.

**( ) Repeak IF transformers T3 and T4, observing maximum transmitter grid current readings on 15 meters.

COMPLETE THE FOLLOWING OPERATIONS BEFORE BEGINNING FINAL NEUTRALIZATION AND ALIGNMENT

( ) Connect a low impedance, 50 Ω, nonreactive (low SWR ratio), dummy load to the RF output coaxial jack. Such a load should be capable of dissipating 100 to 125 watts and should be constructed similar to the HEATHKIT Dummy Load. Such dummy loads are described in amateur handbooks.

FINAL AMPLIFIER NEUTRALIZATION

There are several methods that may be used to properly neutralize the final amplifier of the Transmitter. The method that you use will depend upon the equipment available.

The methods described in the manual are:

1. Grid Dip method. This requires a grid dip oscillator.
2. The VTVM method. This requires a VTVM with a RF probe.
3. The observed Minimum Plate Current-Maximum Power Output method. No external equipment is required.

GRID DIP OSCILLATOR METHOD

Refer to Figure 26 for the following steps.

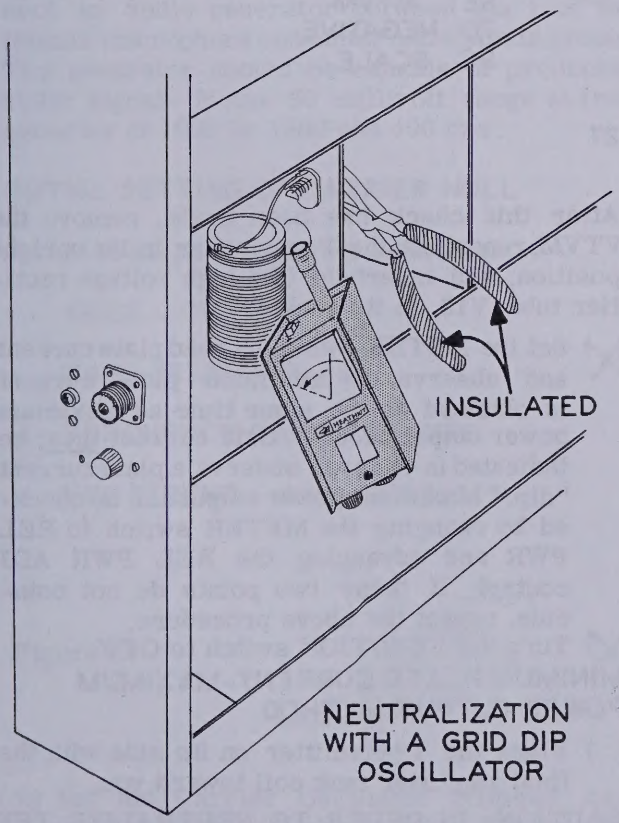


Figure 26

( ) Turn the FUNCTION switch OFF and be sure that the 5R4 high voltage rectifier tube, V13, is removed from its socket.

( ) Place the Transmitter on its side with the final tank coil toward you.

( ) Turn the FUNCTION Switch to PTT-VOX.

( ) Tune the Transmitter up at 14,250 kc in the CW mode - observing grid current. (See Page 130 for tuning instructions.)

( ) With the key closed, tune the grid dip oscillator (used as a diode detector) to the frequency of the Transmitter by coupling it to the 20 meter portion of the final tank coil. This will be indicated by a peak reading on the meter of the grid dip oscillator.

( ) Rotate the DRIVER TUNE and FINAL TUNE controls to increase this peak to its maximum point. The indication now showing on the grid dip oscillator is a residual RF voltage appearing on the "hot" end of the final tank coil.

( ) Using insulated long-nose pliers, rotate the shaft of variable capacitor, C58, for a minimum reading on the meter of the grid dip oscillator.

( ) Remove the grid dip oscillator from the final tank coil compartment and tip the Transmitter to its normal upright position.

( ) Be sure that a dummy load is connected to the antenna coaxial jack. Install the 5R4 high voltage rectifier tube in tube socket V13.

( ) Tune the transmitter up at 14,250 kc in the CW mode. Adjust the transmitter for 1/4 to 1/2 ma of grid drive.

( ) Set the METER switch to read plate current and observe if minimum plate current is obtained at the same time as maximum power output. Maximum power output can be checked by changing the METER switch to REL PWR and advancing the REL PWR ADJ control. If these two points do not coincide, repeat the neutralizing adjustment. Grid current must be indicated in order to observe a plate current "dip."

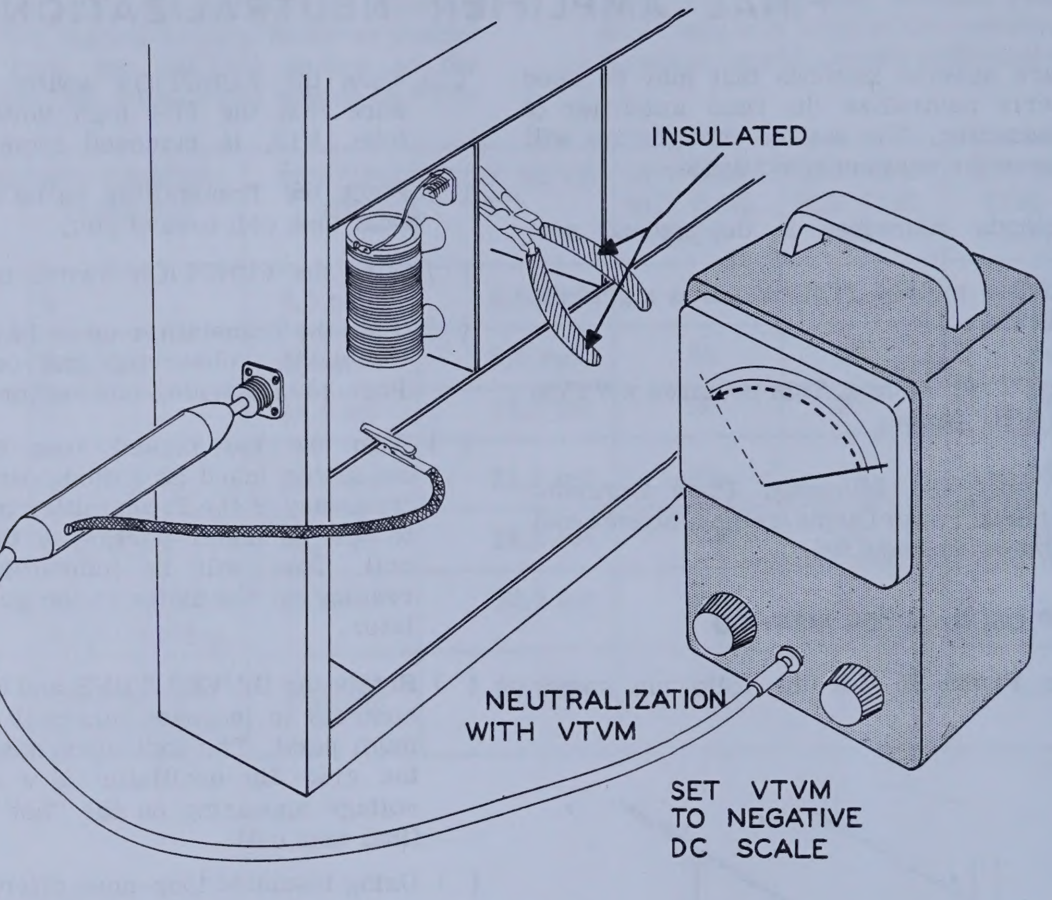


Figure 27

VTVM WITH RF PROBE METHOD

Refer to Figure 27 for the following steps.

☒ Turn the FUNCTION switch to OFF and be sure that the 5R4 high voltage rectifier tube, V13, is removed from its socket.

☒ Place the Transmitter on its side with the final tank coil toward you. Connect the RF probe of a VTVM between the RF output lug on the final tank coil and chassis ground. Set the VTVM for -DC. Set the VTVM on its highest scale, reducing the scale as necessary to obtain a useful reading. Turn the FUNCTION switch to PTT-VOX. Tune the Transmitter up in the CW mode at 14,250 kc. Peak the DRIVER TUNE and the FINAL TUNE controls for a maximum reading on the VTVM. Now rotate neutralizing capacitor C58 until the voltage reading on the VTVM falls to a minimum reading.

After this check has been made, remove the VTVM, reposition the Transmitter in its upright position, and insert the 5R4 high voltage rectifier tube, V13, in its socket.

☒ Set the METER switch to read plate current and observe if minimum plate current is obtained at the same time as maximum power output occurs. Grid current must be indicated in order to observe a plate current "dip." Maximum power output can be checked by changing the METER switch to REL PWR and advancing the REL PWR ADJ control. If these two points do not coincide, repeat the above procedure.

☒ Turn the FUNCTION switch to OFF.

MINIMUM PLATE CURRENT-MAXIMUM POWER OUTPUT METHOD

☐ Place the Transmitter on its side with the final amplifier tank coil toward you.

CAUTION: IN ORDER TO NEUTRALIZE THE FINAL AMPLIFIER BY THIS METHOD, IT IS NECESSARY TO HAVE HIGH VOLTAGE AP-

PLIED. THEREFORE, USE EXTREME CARE WHEN MAKING THE FOLLOWING ADJUSTMENTS.

NOTE: Reference to the operating instruction section (Page 130) on tuning the transmitter in the CW mode will prove helpful for the following steps.

(X) Be sure that a dummy load is connected to the antenna RF output coaxial jack. Install 5R4 high voltage rectifier tube V13. Turn the FUNCTION switch to PTT-VOX.

(X) Tune the transmitter up at 14,250 kc in the CW mode. Adjust the grid current for 1/4 to 1/2 ma. Maintain the loading control at the 50 Ω point.

( ) Adjust the Transmitter for a minimum plate current indication, then place the METER switch in the REL PWR position. If maximum power output does not occur at minimum plate current, adjust capacitor C58 in small increments. NOTE: Use a pair of insulated long-nose pliers for this adjustment. Grid current must be indicated in order to observe plate current "dip."

( ) Each time C58 is adjusted, check the minimum plate current and maximum power output conditions. Continue adjusting C58 until maximum power output is obtained at minimum plate current.

( ) Turn the FUNCTION switch to STDBY and tip the Transmitter to its normal upright position.

FINAL ALIGNMENT

NOTE: In order to later accurately set the carrier oscillator frequency in proper relation to the slope on the upper side band pass crystal filter, it will be necessary to temporarily connect an audio generator between pin 1 of the female microphone connector and chassis ground. The generator should be capable of producing audio signals in the 30 millivolt range at frequencies of 1000 or 1500 and 400 cps.

INITIAL SETTING OF CARRIER NULL

Set the front panel controls as follows:

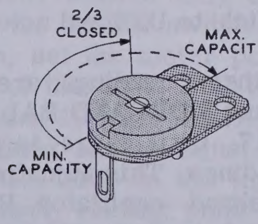
✓ MODE - CW

✓ BAND SELECTOR - 3.5

✓ FREQUENCY CONTROL - VFO

✓ VFO TUNING - above 3800 kc

Figure 28



(X) Set the Carrier Oscillator trimmer capacitor C80 2/3 closed. See Figure 28.

(X) VOX SENSITIVITY - Clockwise.

(X) FUNCTION switch PTT-VOX.

(X) With the Transmitter key down, tune the DRIVER and FINAL TUNE controls for full output power.

✓ (X) Tune the station receiver to maximum "S" meter reading on the Transmitter Frequency. Shorten the receiving antenna so that with the receiver RF gain full on (with no transmitter output) the "S" meter indicates zero "S" units and full scale with maximum transmitter output.

(X) Now change the transmitter and receiver MODE switches to USB. Maintain the receiver setting. Using a temporary jumper, short microphone pin 2 to ground. This will key the Transmitter. Be sure the AUDIO GAIN control is counterclockwise.

(X) Rotate Carrier Null potentiometer, R118, until a minimum receiver "S" meter reading is indicated.

(X) Rotate Carrier Null trimmer capacitor, C9, until a minimum receiver "S" meter reading is indicated.

(X) Repeat the above steps until the "S" meter reading is substantially zero.

(X) Remove the jumper from pin 2 of the microphone connector.

SETTING CARRIER OSCILLATOR FREQUENCY

(X) Connect the audio signal leads from the audio signal generator between pin 1 and chassis ground in the front panel MIC jack.

(X) Keeping the MODE switch in the USB position, change the METER switch to the GRID position.

(X) Place the AUDIO GAIN control at its 10 o'clock position and advance the audio signal generator output at a frequency of 1000 or 1500 cps until Transmitter grid current just begins to flow. Now slowly reduce the audio generator output until the Transmitter grid current is just zero. Note the audio generator output setting.

(X) Change the METER switch to REL PWR output position and adjust the meter reading to exactly full scale using the REL PWR ADJ control.

(X) Change the audio generator frequency to 400 cps and adjust its output to exactly the same level as was used at the frequency of 1000 or 1500 cps.

(X) Rotate carrier oscillator trimmer capacitor C80 marked CARRIER SET until a REL PWR output reading of exactly half scale is indicated. This adjustment places the 400 cps audio signal at a point of -6 db down the slope of filter FL1. At this time, audio response between 400 cps and 3000 cps will be not less than -6 db. Once set (providing carrier crystal and crystal filter remain unchanged), do not change this adjustment.

(X) Remove the audio signal generator and place the FUNCTION switch in STDBY.

(X) Rotate the AUDIO GAIN control fully counterclockwise.

SETTING SIDEBAND FREQUENCY

( ) Plug in the microphone.

NOTE: In each of the following steps, the push-to-talk (abbreviated PTT) microphone button is depressed to obtain a signal from the Transmitter which is tuned in on the station receiver. The microphone button may be depressed, the adjustment called for made, and then the button released until the next adjustment is called for.

(X) Turn FSK trimmer capacitor C92 to its fully closed position.

(X) Allow the Transmitter to remain in the USB mode.

(X) Turn the VOX SENSITIVITY control fully counterclockwise.

(X) Change the FUNCTION switch to the PTT-VOX position.

(X) Depress the PTT button and tune the transmitter signal in on the receiver (in CW mode) for zero beat.

(X) If not enough signal is available, more may be obtained by rotating carrier null potentiometer, R118, slightly in either direction. Release the PTT button.

(X) Change the Transmitter MODE switch to LSB. Be sure not to disturb the receiver tuning control.

(X) Depress the PTT button and adjust LSB trimmer capacitor, C91, for zero beat in the receiver. This adjustment sets the frequencies of the sideband oscillator, V4, and their relationship to the carrier oscillator frequency. Once set (providing carrier, filter or sideband crystals remain unchanged), make no further adjustments. Release the PTT button.

SETTING SIDEBAND BALANCE OUTPUT

( ) Set the METER switch to the REL PWR output position. Set the REL PWR ADJ control fully clockwise.

( ) Depress the PTT button and note the meter output reading. (If not high enough, the CARRIER NULL potentiometer, R118, may be rotated.)

( ) Switch to USB and note this output reading.

( ) If these readings are not exactly equal, adjust SIDEBAND BALANCE potentiometer, R117, until there is no difference in the readings. This adjustment sets the level of sideband oscillator V4 to provide equal output in both sideband modes. Once set (providing carrier or sideband crystals remain unchanged), make no further adjustments.

FINAL CARRIER NULL SETTING

( ) With the station receiver set as in the "Initial Setting of Carrier Null" on Page 119, depress the PTT button.

( ) Again rotate CARRIER NULL potentiometer, R118, for a minimum receiver "S" meter reading. Now rotate CARRIER NULL trimmer capacitor, C9, until a minimum receiver "S" meter reading is reached.

NOTE: The adjustment of CARRIER NULL potentiometer, R117, and capacitor C9 interact. With each setting of capacitor C9 a change in the resistance setting of R118 will bring a lower "S" meter reading. When the receiver "S" meter reaches zero, the receiver may be detuned from zero beat and controls R118 and C9 adjusted for the lowest audio signal from the receiver. With the completion of this adjustment, the carrier should be nulled and remain so for both LSB and USB modes.

CAUTION: It is suggested for the final null adjustment that plenty of time be allowed, and that both Transmitter and receiver be maintained at ambient operating temperatures and the carrier null be checked over a period of several hours to make sure the null remains at the original zero "S" meter level. Readjust R118 and C9 if necessary.

This completes the final carrier null adjustment. Once set, providing no serious mechanical changes take place which could move components, the setting should remain constant. An occasional recheck should convince the station operator of the reliability of his settings.

NOTE: It will be advisable to recheck this adjustment after cabinet installation.

( ) A final check may be made by reducing the receiver RF gain and advancing receiver audio gain controls. Advance the Transmitter AUDIO GAIN to about 10 o'clock and speak into the microphone while monitoring your voice on the station receiver. Modulation should be clear and clean if properly tuned.

TRAP TUNING

Tuning of the 40 and 20 meter traps is accomplished by tuning for a minimum receiver "S" meter reading at the frequencies indicated below with the Transmitter tuned at the stated frequencies in the CW mode.

SET BAND TO	SET DRIVER TUNE TO	SET VFO TO	TUNE RCVR TO	SET TRAP TO MINIMUM
6.9	Tune for max grid reading	7.0 mc	6.8 mc	40 trap
13.9	Tune for max grid reading	14.25 mc	14.15 mc	20 trap

SETTING ALC METER LEVEL

( ) With the METER switch in the ALC position (AUDIO GAIN control fully counterclockwise) and the MODE switch in LSB or USB position, set the meter pointer to the lower edge of the white ALC box corresponding to the 100-250 mark on the meter scale. Using Meter Adjust control R113 marked ALC SET on the top plate. This is the proper resting point for the ALC indication.

CHECK OF RELATIVE POWER ADJUST CONTROL

(✓) Return the Transmitter to CW and the METER switch to REL PWR. Key the Transmitter and rotate the REL PWR ADJ control R114. In normal operation, it should be possible to vary the indication from zero to maximum output. In this position, the meter indicates relative power output.

SETTING FSK FREQUENCY

( ) Insert a standard two circuit key plug in the FSK key jack on the Transmitter rear apron. If a teletype machine is available, the contacts from the keyboard may be connected to the FSK keying plug. If no teletype transmitter is available, the FSK frequency may be set by grounding the FSK key plug (with the outer plastic body of the plug removed) using a screwdriver.

( ) Remove the key plug from the front panel KEY jack.

( ) Now turn the Transmitter MODE switch to FSK position and the FUNCTION switch to MANUAL. Tune the resulting signal to zero beat on the station receiver. Now short the FSK key plug. The resulting beat note produced in the receiver is the amount of frequency shift available before adjustment.

( ) Rotate frequency shift trimmer capacitor C92 to produce the desired frequency shift in cycles per second. If an audio oscillator is available with speaker attached, it may be used as a direct audible comparison between the beat note produced by the Transmitter and that produced by the audio oscillator. Each time the MODE switch is turned to FSK, this resulting beat note will appear and no further resetting will be necessary unless a change in FSK frequency shift is desired.

Note: After setting the FSK frequency, return to the paragraph "SETTING SIDEBAND FREQUENCY" (Page 120) and recheck this adjustment.

VOX CONTROL FUNCTIONS-CW-AM-SSB

(✓) Return the Transmitter to the CW mode and insert a radiotelegraph key plug in the front panel KEY jack (key contacts open). Turn the FUNCTION switch to PTT-VOX and recheck the VOX DELAY R115 and VOX SENSITIVITY R109 controls. Counterclockwise rotation of R109 with the key down should cause relay K to open somewhere between 3 and 12 o'clock of the knob travel. Clockwise rotation of R109 should cause relay K to close somewhere within the same area of knob travel. Both checks should be made with the key closed. Full counterclockwise rotation of R115 should give minimum time delay when the key is released. Full clockwise rotation of R115 should give maximum time delay when the key is released.

2

(✓) Reduce the plate current to 100 milliamperes by rotating the DRIVE LEVEL control counterclockwise and change the MODE switch to the AM position. Key the Transmitter by speaking into the microphone and again recheck operation of the VOX DELAY control R115 and VOX SENSITIVITY control R109, varying the two in the AM mode to produce the same results as in the previous step.

(✓) Perform the same VOX control checks in LSB and USB modes. Each should react the same in all modes with or without modulation (AUDIO GAIN control open or closed). Successful tests indicate proper operation of the VOX controls as well as a partial check of the MODE switch.

MODE SWITCH FUNCTIONS

(✓) Return the Transmitter to CW, FUNCTION switch to PTT-VOX, and advance the DRIVE LEVEL control to produce full transmitter output. Key the Transmitter to check normal relay K operation. (Repeat first step under VOX Control Functions.)

(✓) Reduce the plate current to 100 milliamperes, using the DRIVE LEVEL control. Change the MODE switch to AM (FUNCTION switch still in PTT-VOX). You should observe the following results: In this mode, relay K should not close while keying the Transmitter using the radiotelegraph key inserted in the front panel. Relay K should close when the microphone button is depressed. Relay K should close when speaking into the microphone, providing the VOX SENSITIVITY is set anywhere from 12 to 5 o'clock.

(✓) Change the MODE switch to the FSK position - relay K should not close when keying or depressing the microphone button.

(✓) Change the MODE switch to LSB position - relay K should not close with keying of the Transmitter but should close upon depressing the microphone button or when speaking into the microphone.

(✓) Change the MODE switch to USB position - relay K should not close with keying, but should close on depressing the microphone button or when speaking into the microphone.

Successful completion of these checks indicate the correct functioning of the MODE switch.

FUNCTION SWITCH FINAL CHECK

( ) Correct operation of the FUNCTION switch is indicated by the following checks:

( ) Placing the FUNCTION switch in the STDBY position should make it impossible to close relay K in any position of the MODE switch, either by keying the Transmitter, depressing the microphone button, or speaking into the microphone. It will be normal however, to hear the CW keying of the driver stage in the station receiver, providing the RF DRIVE LEVEL control R112 is in its clockwise position and the DRIVE TUNE control is approximately correct for the frequency used.

( ) Placing the FUNCTION switch in PTT-VOX should restore the Transmitter to full operating capability in all modes except FSK. Keying in CW or depressing the microphone button or speaking into the microphone in AM (always at a reduced plate current level of 100 milliamperes), LSB and USB should close relay K with normal output.

( ) Although not yet connected to the receiver, placing the FUNCTION switch in the SPOT position will make it possible to hear the Transmitter keyed tone in the station receiver, providing the SPOT LEVEL control is advanced in a clockwise direction, but relay K should not close in any position of the MODE switch. Return the SPOT LEVEL control to its fully counterclockwise position after this check.

( ) Placing the MODE switch in CW and the FUNCTION switch to MANUAL should close relay K. No output should occur until closing of the radiotelegraph key. Return the FUNCTION switch to STDBY.

( ) Place the MODE switch in AM (reduced 100 milliampere plate current) and turn the FUNCTION switch to MANUAL. Relay K should close and Transmitter output should occur with or without modulation. Return the FUNCTION switch to STDBY.

( ) Place the MODE switch in FSK position, remove the front panel key plug, and turn the FUNCTION switch to MANUAL. Relay K should close and full Transmitter output should occur. Keying the FSK key jack should change only the carrier frequency. Return the FUNCTION switch to STDBY.

( ) Place the MODE switch in the LSB position and turn the FUNCTION switch to MANUAL. Relay K should close but no Transmitter output should occur until the AUDIO GAIN control is advanced in a clockwise direction while speaking into the microphone. Return the FUNCTION switch to STDBY.

The successful completion of these checks indicates proper operation of the FUNCTION switch. If other than normal operation is experienced, refer to the In Case Of Difficulty section. This completes Final Test and Adjustment of your Marauder Transmitter.

NOTE: Before cabinet installation, be sure the cable harness and internal wiring along the rear apron are positioned so the rear apron screws will not cause a short circuit when they are installed.

CABINET INSTALLATION

( ) Install the four large rubber feet on the cabinet. Use 8-32 x 3/8" hardware. Insert a screw through each rubber foot and then through the cabinet bottom. Use #8 lockwashers under the nuts and tighten securely. See Figure 29.

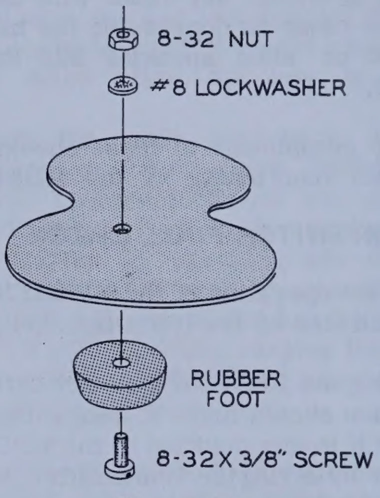


Figure 29

( ) Place the Transmitter in front of the cabinet and pass the line cord through the opening in the back of the cabinet. Now slide the Transmitter on the rails and into the cabinet, while guiding the line cord through the opening in the back. Use ten 10-32 phillips head screws to fasten the front panel to the cabinet. Use eight #10 sheet metal screws through the back of the cabinet into the rear chassis apron. Tighten all screws securely.

NOTE: After cabinet installation, recheck the rear collars on the VFO tuning and plate loading shafts to eliminate any binding action, if present.

INSTALLATION

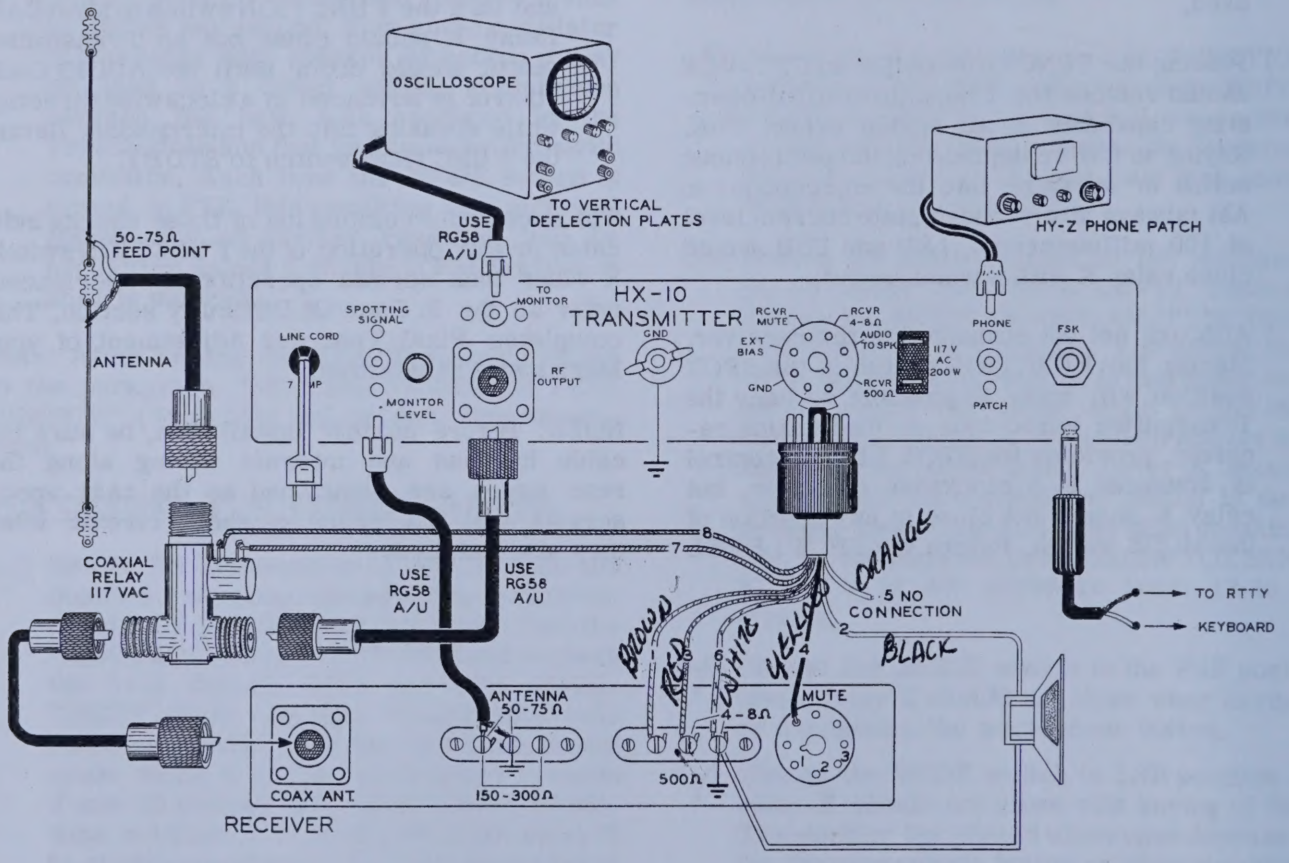


Figure 30

W4FGH

Refer to Figures 30 and 31 for clarification of the following information. Either of these figures may be used, depending on whether or not a linear amplifier is used with the Transmmitter.

LOCATION

Although the Transmitter runs at normal ambient temperatures, it will be well to avoid excessively warm locations, such as those near radiators or heating vents. The Transmitter should be placed in a location that provides adequate space around it, permitting free air circulation through the cabinet openings.

POWER SOURCE

This Transmitter is designed to operate on 117 volts 50/60 cps AC power. With no connection made to the 200 watt AC socket on the rear apron, the peak power consumption is about 400 watts. If this socket is used, the total power consumption will run near 600 watts. Attention should be given to the source of power and the AC power outlet should be properly fused and fed with adequate wiring. Take into consideration any other appliances that may be attached to this line.

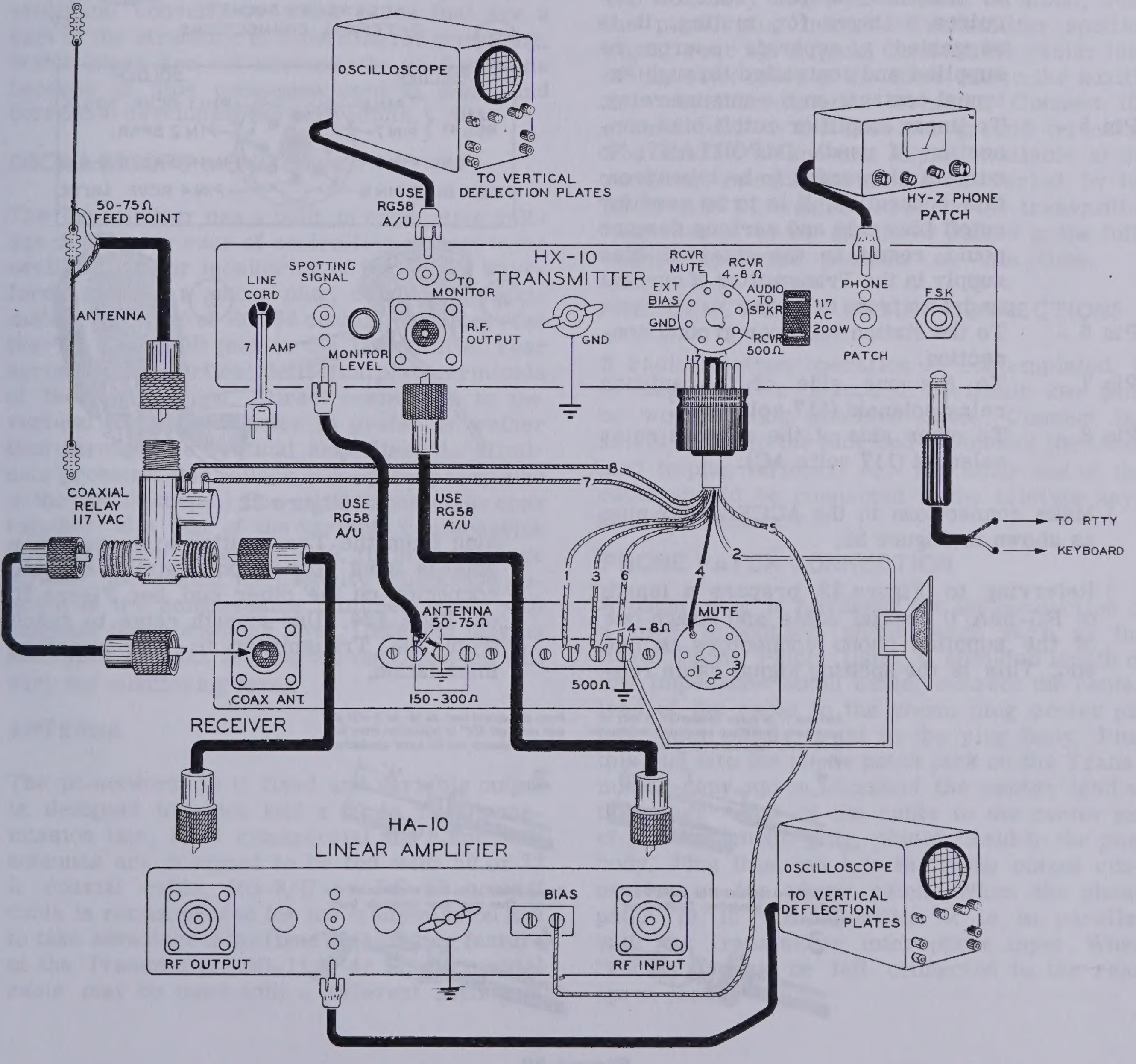


Figure 31

ACCESSORY SOCKET CONNECTIONS

A male octal plug is supplied for accessory socket connections. Leads from this plug to the station receiver, antenna relays, and any amplifier which may be used are shown in Figure 31 (on Page 125) and are to be made as follows:

Brown Pin 1 - To receiver 500 Ω output.
Black Pin 2 - To receiver speaker.
Red Pin 3 - To receiver 4-8 Ω output.
YELLOW Pin 4 - To the receiver mute connection on the receiver. This is a grounding function in receive and ungrounding in transmit. If your receiver requires voltages for muting, it is suggested a separate source be supplied and controlled through external contacts on the antenna relay.
ORANGE Pin 5 - To linear amplifier cutoff bias connection (if used). IMPORTANT: No current is intended to be taken from this connection. It is to be used for cutoff bias only and serious damage could result to the internal bias supply in the Transmitter if current is drawn from this pin.
white Pin 6 - To the station receiver ground connection.
Ac cord { Pin 7 - To the one side of the antenna relay solenoid (117 volts AC).
Pin 8 - To other side of the antenna relay solenoid (117 volts AC).

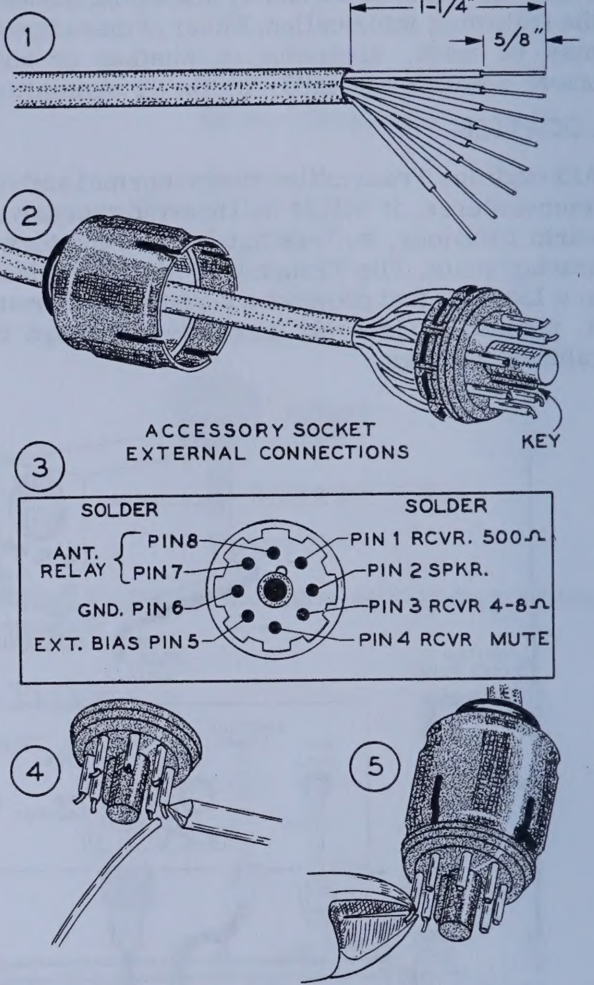
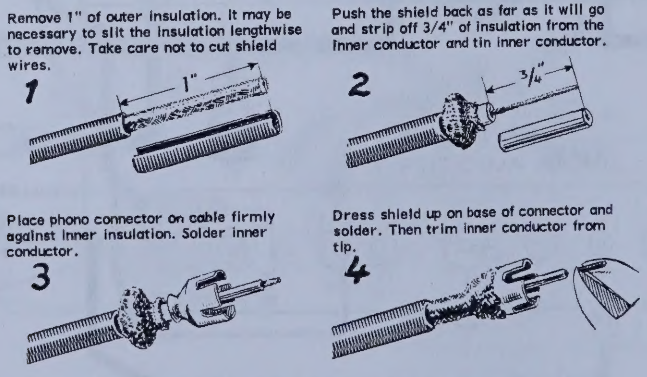


Figure 32

( ) Make connections to the ACCESSORY plug as shown in Figure 32.

( ) Referring to Figure 33, prepare a length of RG-58A/U coaxial cable and attach one of the supplied phono connectors on one end. This is the spotting signal cable running from the Transmitter to the receiver antenna input connection. Install a suitable connector on the other end. See Figure 30 on Page 124. Use enough cable to reach from the Transmitter to your receiver installation.



Remove 1" of outer insulation. It may be necessary to slit the insulation lengthwise to remove. Take care not to cut shield wires.

Push the shield back as far as it will go and strip off 3/4" of insulation from the inner conductor and tin inner conductor.

Place phono connector on cable firmly against inner insulation. Solder inner conductor.

Dress shield up on base of connector and solder. Then trim inner conductor from tip.

Figure 33

GROUND

The chassis ground connection that is provided on the rear apron of the Transmitter should be connected to an actual earth ground by a heavy lead (#12 or #14 wire will suffice, although heavier wire may be used). This ground lead should be as short as possible and be connected to a ground rod driven into the earth at least 6 feet. If the transmitter is over a half-wave length away from the ground rod at the operating frequency, a system of three wires may be used, each wire being a different length. It is recommended that you do not use gas pipes, electrical conduit, or water pipes that are a part of the structure of a dwelling for grounding. Water pipes are not necessarily good grounds because of pipe compound used at joints and corrosion developing between joints.

OSCILLOSCOPE MONITORING

The Transmitter has a built-in capacative voltage divider for ease of controlling voltage to the oscilloscope for monitoring of the output waveforms. Using a phono plug, connect approximately four feet of RG-58 coaxial cable between the TO MONITOR jack on the Transmitter rear apron and the vertical deflection plate terminals of the oscilloscope. (Direct connection to the vertical deflection plates is preferred rather than through the vertical amplifiers to eliminate problems due to lack of frequency response in the oscilloscope.) The capacitance of the coax together with that of the variable compression mica trimmer capacitor C79, form the voltage divider. Increasing the capacity (clockwise rotation of the compression trimmer shaft) will increase the monitoring level. Different lengths and types of coax feeding the oscilloscope will vary the monitoring level.

ANTENNA

The pi-network 50 Ω fixed and variable output is designed to work into a 50 to 75 Ω transmission line. Most commercial and home built antennas are designed to be fed with 50 or 72 Ω coaxial cable. RG-8/U or RG-58 coaxial cable is recommended for the transmission line to take advantage of the fixed 50 Ω loading feature of the Transmitter. RG-11/U or RG-59 coaxial cable may be used with a different setting of the loading control. Connect the transmission line to the RF OUTPUT coaxial jack on the rear apron, using a standard coaxial plug (Amphenol PL-259 or equal). If an antenna relay is used, the other end of this transmission line will be connected to the Transmitter side of the antenna relay, using an identical plug at the other end.

SPOTTING CONNECTION TO RECEIVER

A phono plug with RG-58 cable was previously prepared using the most convenient short length between the Transmitter spotting signal jack and auxiliary receiver antenna terminal. Plug the phono plug into the Transmitter spotting signal rear apron jack. Connect the center lead of the coax cable at the other end to the auxiliary receiver antenna terminal. Connect the ground lead to the receiver ground terminal. The amount of spotting signal available at the receiver antenna terminals is varied by the SPOT LEVEL control R111 on the transmitter front panel, which should be placed in the fully counterclockwise position at this time.

FREQUENCY SHIFT KEYING CONNECTIONS

If radio teletype operation is contemplated, it is suggested a standard 2-circuit key plug be wired, using shielded cable. Connect the shield braid to the plug body. Connect the other lead to plug terminal #1. The other end of the cable should be connected to the teletype keyboard terminals.

PHONE PATCH CONNECTION

A phono plug is furnished for the connection of a high impedance phone patch such as the Heath Phone Patch. Using a shielded length of low impedance audio cable, connect the center lead of the cable to the phono plug center pin and outer shield braid to the plug body. Plug this end into the phone patch jack on the Transmitter rear apron. Connect the center lead at the other end of the cable to the center pin of another phono plug, shield braid to the plug body. Plug this end into the mike output connection on the phone patch. When the phone patch is in "ON" position it is in parallel with the transmitter microphone input. When "OFF", it may be left connected to the rear apron jack.

OPERATION

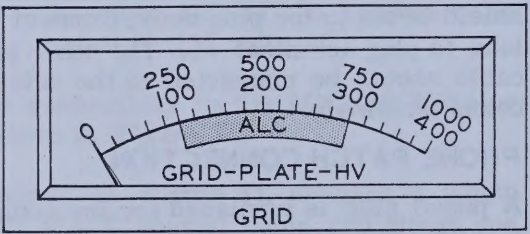
NOTE: It should be noted that an amateur radio operator and station license is required to place this Transmitter on the air. Information regarding licensing and amateur frequency allocations may be obtained from publications of the Federal Communications Commission or the American Radio Relay League in the U.S.A.

METER READINGS

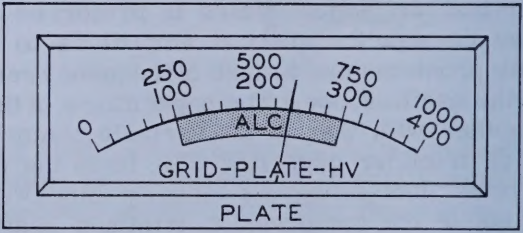
Referring to Figure 34, study the meter and note how it reads for various positions of the meter switch. Observe that it has two main scales and the ALC area in white; one scale reading from zero to 400 in which the small divisions represent 20 milliamperes each. The other scale from zero to 1000 or (divided by 1000) zero to 1, in which the small divisions represent 50 volts or .05 milliamperes each.

These scales should be interpreted as follows:

METER SWITCH POSITION	MEASURES	RANGE OF READING
GRID	Final grid current	0 to 1 ma
PLATE	Final plate current	0 to 400 ma
ALC	ALC voltage	ALC (white area only)
REL PWR	Relative power output	Adjustable zero to maximum with REL PWR ADJ control.
HV	Final high voltage	0 to 1000 volts.

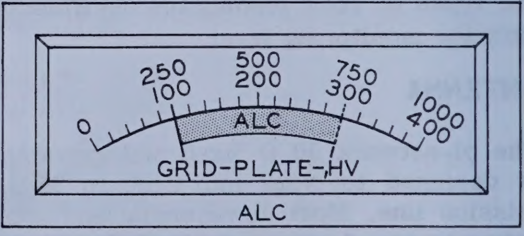


GRID

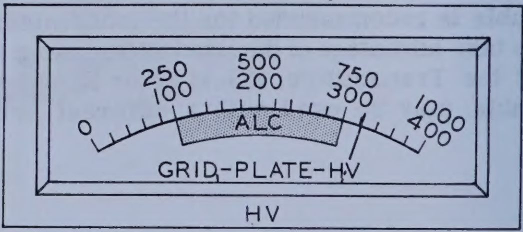


PLATE

METER SWITCH POSITION	SCALE READING	FULL SCALE
GRID (CURRENT)	0 - 1000 ÷ 1000	0 - 1 MA
PLATE (CURRENT)	0 - 400	0 -400 MA
ALC (AUTOMATIC LEVEL CONTROL)	ALC BOX ONLY	
	POINTER SET AT LEFT EDGE OF ALC BOX	MAXIMUM MODULATION RIGHT EDGE OF ALC BOX
REL. POWER	0 - 1000	RELATIVE-ADJUSTED BY "REL PWR ADJ" CONTROL



ALC



HV

Figure 34

CRYSTAL FREQUENCY CONTROL

Crystals to be used for oscillator frequency control are not supplied. For your convenience in ordering any such crystals as may be desired, it is pointed out that such crystals must have a pin spacing of .486" and a pin diameter of .093" to fit the socket on top of the VFO chassis. Since the frequency control crystal oscillator operates in the same frequency range as the VFO (from 4900 to 5500 kc), it will be apparent that each crystal within the range of this oscillator will produce seven output frequencies because there are seven bands, each having different heterodyne mixing frequencies. To compute a desired crystal frequency, it is necessary to subtract the desired operating frequency from the heterodyne mixing frequency chart, a copy of which is reprinted below:

As an example, let us say you desire to operate at an output frequency of 28.8 megacycles in band 10B. Subtracting 28.8 from the mixing frequency of 34.0 megacycles indicates a crystal frequency of 5.2 megacycles would be required. If an output frequency of 7.220 megacycles was desired in the 40 meter band, subtracting 7.22 megacycles from 12.40 megacycles indicates that a crystal frequency of 5.18 megacycles would be required. Conversely, if you have a 5.0 megacycle crystal and wish to know what output frequencies would result, you could subtract the crystal frequency from the mixing frequency indicating this crystal would provide output frequencies of 4.0, 7.4, 14.4, 21.4, 28.4, 29.0, and 29.6 megacycles.

Regardless of what crystal frequency is chosen, when the FREQUENCY control switch on the front panel is in the XTAL position, the crystal frequency and position of the BAND SELECTOR will determine what the output frequency will be. Trimmer capacitor C129 on the VFO enclosure will vary the crystal frequency of most crystals to compensate for any error in crystal grinding or deviations of the measured desired frequency within small tolerances.

BAND	MIXING FREQUENCY	OUTPUT FREQUENCY RANGE
10C	34.6 megacycles	29.1 - 29.7 megacycles
10B	34.0 megacycles	28.5 - 29.1 megacycles
10A	33.4 megacycles	27.9 - 28.5 megacycles
15	26.4 megacycles	20.9 - 21.5 megacycles
20	19.4 megacycles	13.9 - 14.5 megacycles
40	12.4 megacycles	6.9 - 7.5 megacycles
80	9.0 megacycles	3.5 - 4.1 megacycles

OPERATING INSTRUCTIONS

NOTE: It will be assumed all connections to be used are in place, including the line cord, antenna relay, spotting cable to receiver, monitor level to scope, ground connection, accessory socket connections to relay, receiver speaker and ground, phone patch, and FSK KEY jack.

CW

Set the controls as follows:

FUNCTION switch - STDBY (plug the key into the front panel KEY jack, contacts open.)
BAND SELECTOR - desired band.
AUDIO - fully counterclockwise.
MODE switch - CW.
VOX SENSITIVITY - fully clockwise.
VOX DELAY - fully counterclockwise.
VOX ANTI-TRIP - fully counterclockwise.
DRIVE LEVEL control - fully clockwise.
FREQUENCY control - VFO or XTAL.
VFO - desired frequency (if used), no setting required if crystal frequency control is used.
FINAL LOAD - 50 Ω.
FINAL TUNE - desired band area indicated.
METER switch - GRID.
REL PWR ADJ - 9 o'clock.
SPOT LEVEL control - fully counterclockwise.
MONITOR LEVEL control (rear apron) minimum capacity (if scope is used).

The volume from the tone oscillator may be changed by adjusting R119.

( ) Close the key and tune the station receiver to the frequency selected.

NOTE: Open the key between the steps to follow.

( ) Adjust the DRIVER TUNE control for the loudest signal in the receiver. (If too loud, reduce DRIVE LEVEL.)

( ) Adjust the FINAL TUNE control for the loudest signal in the receiver. (Again, if too loud, reduce DRIVE LEVEL.)

( ) Turn FUNCTION switch to PTT-VOX.

( ) Close the key and set the grid drive to about 1/2 milliampere by advancing the DRIVE LEVEL control (if low) or by retarding (if high) and rotating the DRIVER TUNE control for maximum grid drive.

( ) Turn the METER switch to REL PWR, close the key, and obtain a midscale reading by rotating the REL PWR ADJ control.

( ) Close the key and rotate the FINAL TUNE control for maximum power output indication.

NOTE: TUNING OF THE FINAL AMPLIFIER FOR MAXIMUM RELATIVE POWER OUTPUT WITH METER IN "REL PWR" POSITION ONLY IS IMPERATIVE. METER "PLATE" POSITION IS USED TO CHECK THE AMOUNT OF PLATE CURRENT ONLY, NOT RESONANCE, UPON TUNE UP.

( ) Change the METER switch to PLATE, close the key, and check plate current. It should run between 220-250 milliamperes.

( ) Now advance the keying MONITOR LEVEL control, R119, to the desired volume level (located inside the cabinet just to the rear of relay K on the top plate). Be sure to avoid contact with the relay or the rear of the METER switch which is adjacent to this control.

WA9RGY

If your antenna does not present a nonreactive 50 Ω load to the Transmitter, it would be advisable to adjust the FINAL LOAD control for maximum power output at this time, retuning the FINAL TUNE control. (Early correction of antenna standing wave ratio of more than 2 to 1 is the best solution to this problem.)

( ) Set the VOX DELAY control to the desired CW break-in delay time.

The Transmitter is now fully tuned for CW operation, using VOX control break-in. The tuning operations above are basic for all other modes. Once familiar with them, no difficulty will be experienced and you will find tuneup requires much less time than it takes to read this portion of the procedure.

SSB

( ) Tune up in CW.

( ) Change the MODE switch to USB or LSB as desired.

( ) Change the METER switch to ALC position.

( ) Advance the AUDIO GAIN control to about 10 o'clock (different voice characteristics and types of microphones may cause this setting to vary between 10 and 12 o'clock). Observing the ALC meter scale, maintain modulation level to confine meter peak readings to the upper edge of the white ALC meter area.

NOTE: With the meter in the ALC position, when the pointer moves this indicates that the Automatic Level Control stage V19 is automatically cutting down the final amplifier driving voltage. There is nothing to be gained by modulating so the pointer reaches peaks outside the ALC area since only distortion and interference to adjacent frequencies will result. See Figures 35A, 35B, and 35C, illustrating typical oscilloscope patterns. Plate current in SSB will normally run between 80 and 100 ma. No grid current will be indicated in this mode. Relative power will normally run 1/4 to 1/3 that indicated in CW.

Oscilloscope pattern and meter reading resulting from CW or single tone modulation. The meter indicates full plate current of 240 ma.

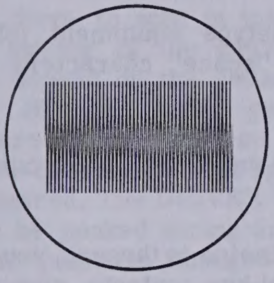


Figure 35A

Oscilloscope pattern and meter reading resulting from SSB voice modulation. Notice the peaks on the oscilloscope pattern. The are sharp, indicating a clean signal, and they attain the same height as the CW or "single tone" pattern of Figure 35A, indicating maximum power input. NOTE: Plate current peak reading is approximately 1/2 or less of maximum "single tone" reading due to meter inertia and voice characteristics. Plate current approximately 100 ma.

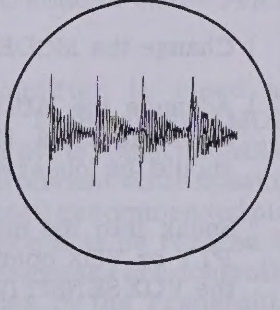
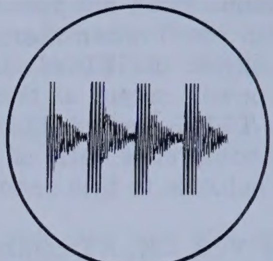


Figure 35B

Figure 35 C

Oscilloscope pattern and meter reading resulting from SSB over-modulation. The meter reads higher, but the scope indicates peak flattening. Operation in this manner causes distortion and severe interference to adjacent frequencies. Plate current approximately 150 ma.



( ) Adjust the front panel VOX DELAY, SENSITIVITY, and ANTI-TRIP controls to suit your operating convenience.

( ) Speak into the microphone normally, using either VOX or PTT operation. If PTT is used, turn the VOX SENSITIVITY and ANTI-TRIP controls fully counterclockwise.

WARNING: When going from any mode to AM, ALWAYS reduce plate current to 100 ma first, then proceed. This precaution will prevent damage to the final amplifiers.

AM

( ) Tune up in CW mode exactly as is done above.

( ) Reduce the plate current to 100 milliamperes with the DRIVE LEVEL control.

( ) Change the MODE switch to AM.

( ) Advance the AUDIO GAIN control to about 10 o'clock (a limit of 100% modulation should be observed on the scope monitor).

( ) Speak into the microphone normally, using PTT or VOX operation. If PTT is used, set the VOX SENSITIVITY control fully counterclockwise and use the PTT switch at the microphone to activate the Transmitter. If VOX is used, the VOX ANTI-TRIP should be set at midscale and the VOX SENSITIVITY control slowly advanced in a clockwise direction until when speaking into the microphone the relay turns the Transmitter on instantly and positively. VOX DELAY should be set for comfortable operating practice.

The Transmitter is now fully tuned for AM phone operation. You will observe that this mode is single sideband AM using the lower sideband (1/2 the normal AM bandwidth).

No grid current will be indicated in this mode.

FSK

NOTE: Audio energy to the receiving converter may be taken from the station receiver through the headphone jack in this mode.

( ) Tune up in CW.

( ) Obtain 1/2 milliampere of grid drive.

( ) Plug the FSK key plug in the FSK KEY jack on the rear apron. (Now connected to the teletype keyboard.)

( ) Change the MODE switch to FSK.

( ) Turn the FUNCTION switch to MANUAL.

( ) Close the Transmitter key contacts (front panel KEY jack).

( ) Start the teletype equipment (observe if "mark" and "space" characters are correct).

( ) Increase grid drive until plate current does not vary.

( ) When transmission is through, you may open the front panel key contacts, sign your station call and return the FUNCTION switch to STDBY.

SPOTTING LEVEL FUNCTION

( ) With the transmitter tuned for operation in the LSB or USB modes, turn the FUNCTION switch to SPOT. (SPOT level control should be fully counterclockwise.)

( ) With the AUDIO GAIN control set for normal SSB operation, speak into the microphone and slowly advance the SPOT LEVEL front panel control in a clockwise direction until you hear your voice in the station receiver. The setting of the SPOT LEVEL control will depend on the setting of the receiver RF, IF, and audio gain controls. The receiver should be set for normal receiving levels comfortable to the operator. DO NOT advance the SPOT LEVEL control too far since audio from the receiver can feedback into the microphone. This feature is provided so you may use the "Talk-On Frequency" method of spotting, if desired, without interrupting a QSO. While in this position, listening to yourself on the station receiver, you may peak the DRIVER TUNE control, if necessary, so the driver stage is peaked at the operating frequency thus avoiding the necessity of returning to the CW mode to retune and putting a signal on the air in the middle of an SSB QSO.

( ) Return the FUNCTION switch to STDBY and the SPOT LEVEL control fully counterclockwise.

( ) Change the MODE switch to CW.

( ) Change the FUNCTION switch to SPOT.

( ) Slowly advance the SPOT LEVEL front panel control in a clockwise direction until you hear the Transmitter signal in the receiver. Note that it is not necessary to hold the key down to spot in this position. Again, the setting of the SPOT LEVEL control will depend on the setting of the receiver RF, IF, and audio gain controls. This feature is provided so you may use the "zero-beat" method of spotting in CW mode if desired. The DRIVER TUNE control may also be peaked during this operation in the event you have changed frequency and do not want to put a signal on the air. If in LSB, USB, or AM modes you may quickly switch to CW for a "zero-beat" spot check, returning to the desired mode by means of the MODE switch.

OPERATION WITH LINEAR AMPLIFIER

( ) See Figure 31 (on Page 125) for operational setup using a linear amplifier.

( ) Remove the Transmitter RF coaxial output line from the antenna relay (or antenna, as the case may be) and connect it to the linear amplifier input circuit.

( ) Provide a common ground for both Transmitter and linear amplifier; this is IMPORTANT.

( ) Connect the external bias connection (BLOCKING BIAS ONLY) from the Transmitter (pin 5 of the accessory socket) to the linear amplifier bias circuit (if required).

( ) Provide the RF cable connection from the linear amplifier output circuit to the antenna or antenna relay.

( ) Using the Transmitter in CW mode, obtain required drive to the linear amplifier. Convenient control of drive level is provided by the DRIVE LEVEL control on the Transmitter.

( ) After the linear amplifier is tuned and loaded, change the Transmitter MODE switch to the desired mode, open the AUDIO GAIN control a small amount while speaking into the microphone until recommended plate current peak indication may be read on the linear amplifier. These peaks are controlled in SSB and AM modes by the Transmitter AUDIO GAIN control and in CW and FSK modes by the Transmitter DRIVE LEVEL control.

IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.
2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.
3. Check to be sure that all tubes are in their proper locations. Make sure that all tubes light up properly.
4. Check the tubes with a tube tester or by substitution of tubes of the same types and known to be good.
5. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.
6. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.
7. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.
8. A review of the Circuit Description will prove helpful in indicating where to look for trouble.
9. In using the chart below, we suggest you use a Process of Elimination approach. The chart indicates the area of possible trouble. Check each element in these areas as well as continuity, using the Schematic and voltages given.

TROUBLESHOOTING CHART

DIFFICULTY	POSSIBLE CAUSE
No power.	1. Check complete 117 V AC wiring against schematic and pictorials. 2. Blown fuses- check continuity.
No VFO filament voltage.	1. Check Schematic and wiring to T1 for error.
No filament voltage other stages.	1. Check Schematic and wiring from lug 4 of terminal strip FE. Lift transformer T2 green lead from lug 4 of terminal strip FE, if necessary, to check filament voltage under no-load conditions.
No bias voltage at terminal FW1.	1. Check Schematic and wiring from transformer T2 to diodes CR5 and CR6. 2. Check polarity of diodes CR5 and CR6. 3. Check polarity of bias filter capacitors C138A and C138B. 4. Check resistors R101 and R76.
No bias voltage at grids of V20-V21.	1. Check continuity from V20-V21 grids through R96, R89, and R90.
No bias voltage at grid of V6-V8.	1. Check continuity from V6-V8 grids through R86 and R87.

DIFFICULTY	POSSIBLE CAUSE
No low voltage B+.	1. Check rectifier V14 - replace if necessary. 2. Check continuity to and from low voltage choke L17. 3. Check polarity and resistance reading to ground of filter capacitor C136A and B - 18 KΩ or higher is normal.
No regulated B+.	1. Check continuity of R95 - should read about +325 volts at one end, +150 volts at the other. 2. Check V17 - replace if necessary. 3. Check continuity of wiring from V17 to lug 1 of terminal strip FY.
No carrier oscillator RF output.	1. Must be measured with a VTVM RF probe - use proper probe. 2. Check V2A plate voltage. 3. Check V2A grid and cathode connections. 4. Check to see if crystal Y1 is properly installed.
No sideband oscillator RF output.	1. Measure only with VTVM RF probe. 2. Check V4 plate voltage. 3. Check V4 grid and cathode connections. 4. Check to see if crystals Y2 and Y3 are properly installed. 5. Check wiring of MODE switch MS4.
No heterodyne oscillator voltages at TP.	1. Measure only with a VTVM 11 megohm isolation probe. 2. Check V6B plate voltage. 3. Check V6B cathode and grid connections. 4. Check wiring to bandswitch segments BS1 and BS3. 5. Check to see if crystals Y4, 5, 6, 7, 8, 9 are installed in their proper sockets.
Relay K fails to close in PTT-VOX position of FUNCTION switch.	1. VOX SENSITIVITY control should be set fully clockwise. 2. No audio voltage available from the Audio Amplifier - check V10B audio output at C115 (must be keyed). Check audio cable for short circuit. 3. Audio oscillator not functioning - check output at V10B grid (must be keyed). 4. Check plate voltages V10A and B. 5. Check grid cathode wiring to V10A and B. 6. Check for wiring error to MODE switch segment MS2 and MS3. 7. Check for keyed audio voltage at V2B grid. 8. Check plate voltage of V2B and V9B. 9. Check grid and cathode connections of V2B and V9B. 10. Check all resistance measurements of V2B and V9B to indicated values. 11. Check polarity of CR3. 12. MODE switch not in CW position.

DIFFICULTY	POSSIBLE CAUSE
VOX DELAY not normal.	1. Check polarity of CR3. 2. Check R64 and R115 for proper resistance values. 3. Check C111 for continuity - should show only resistance of R64 and R115 across it. 4. Check plate voltage of V9B. 5. Check R66, 65 and 67 resistance values. 6. Check for wiring error to FS1 and FS2.
VOX SENSITIVITY control not normal in CW.	1. SENSITIVITY control should be set fully clockwise. 2. Check for audio voltage available from V10A and V10B. 3. Check for wiring error of MS3. 4. Check plate voltage of V9B. 5. Check grid and cathode wiring of V9B. 6. Check for wiring error to R109. 7. Check resistance of R109 and R60.
VOX ANTI-TRIP control not normal.	1. Check for V9A tube failure. 2. Pin 8 of accessory socket not connected to receiver 500 Ω audio output. 3. Check plate and screen voltage of V9A. 4. Check grid and cathode connections to V9A. 5. Check polarity of CR4. 6. Check resistance reading of R63, R104, and R105 and capacitors C119 and C120. 7. Check for wiring error to R110.
PTT feature not operative in AM-SSB.	1. Microphone wired incorrectly - recheck connections. 2. Check for control wiring error from microphone jack to MS1F. 3. Check for wiring error from MS1F to FS2. 4. Check for wiring error from FS2 to the cathode of V9B. 5. Check for V9B tube failure.
VOX SENSITIVITY control not normal in AM-SSB but ok in CW.	1. SENSITIVITY control should be set fully clockwise. 2. Check for V1A tube failure. 3. Check plate and screen voltages at V1A. 4. Check grid and cathode connections of V1A. 5. Check audio voltage from V1A at C6. 6. Check for wiring error at MS3F. 7. Check for wiring error to R109.
FUNCTION switch fails to close relay K in Manual position.	1. Check for V9B tube failure. 2. Check for wiring error to FS1. 3. Check for wiring error from FS1 to cathode of V9B. 4. Check resistance of R65, 66, 67. 5. Check plate voltage of V9B and wiring to relay K solenoid.

DIFFICULTY	POSSIBLE CAUSE
No VFO output.	1. Check V11 for tube failure. 2. Check V12 for tube failure. 3. FREQUENCY control switch should be in VFO position (counterclockwise). 4. Check for a short in the coax cable to the grid of V7. 5. Check resistor R122 for continuity. 6. Check regulated B+ to VFO at pin 5 of V17. NOTE: If VFO wiring errors are responsible, the VFO will have to be removed from the transmitter and checked after removal of its cover. 7. Check plate and screen connections to V11 and V12. 8. Check all grid and cathode connections to V11 and V12. 9. Check for wiring error in the Xtal - VFO switch. NOTE: If a separate power supply is available providing 6.3 V AC and +150 volts DC at 25 ma, operation of the VFO and crystal oscillator may be checked before reinstallation.
Unable to complete IF alignment.	1. Check V3 for tube failure. 2. Check plate voltage of V3. 3. Check V3 grid and cathode wiring. 4. Check for proper T3 connections. 5. Check for V6 tube failure. 6. Check V5 plate and screen voltage. 7. Check V5 grid and cathode wiring. 8. Check for proper T4 connections. 9. Check V6 for tube failure. 10. Check V6A plate and screen voltages. 11. Check V6A grid and cathode wiring. 12. Check wiring of BS2R and BS2F. 13. R112 should be fully clockwise.
Unable to complete Heterodyne mixer and VFO mixer alignment.	1. Check V6 and V7 for tube failure. 2. Check plate and screen voltage of V6 and V7. 3. Check grid and cathode wiring of V6 and V7. 4. Check wiring to BS2R, BS2F, BS4R, and BS4F, including L1, L2, L3, L4, L5, and L6. 5. Check coupling capacitor C46 for short.
Unable to complete initial driver coil alignment.	1. Check V8 for tube failure. 2. Check V8 plate and screen voltages. 3. Check V8 grid and cathode wiring. 4. Check wiring to BS5F and BS5R including L7, L8, L9, L10, and L11. 5. Check coupling capacitor C60 for short. 6. Check coil L19 and L20 lugs for grounding to coil enclosure.

DIFFICULTY	POSSIBLE CAUSE
High voltage - screen voltage not available.	1. Check transformer wiring to V13. 2. Check V13 for tube failure. 3. Check for wiring error to and from L16. 4. Check C104 and 105 for short circuit. 5. Check R53, 54, and 55 for proper resistance reading. 6. Check for wiring error at V15 and V16.
Lack of meter readings or incorrect meter readings.	1. Check wiring to meter. 2. Check wiring to meter switch. 3. Check R56 for plate voltage reading. 4. Check R114 for relative power readings. 5. Check C107, R58, R58, CR7, and wiring to output terminal for relative power readings. 6. Check R38 for grid current readings. 7. Check R39 for plate current readings. 8. Check R22 and MS1R wiring for ALC readings.
Final amplifier low output.	1. Lack of grid drive - retune Heterodyne Mixer and Oscillator, VFO Mixer, and Driver Stages for maximum drive. 2. DRIVER TUNING control not peaked - tune for maximum grid current. 3. Check V20 and 21 for tube failure. 4. No screen voltage - check. 5. Check for wiring error in loading circuit C156, C78A/B, C154, C155. 6. Check for switch wiring error at BS7F and BS7R. 7. Check coupling capacitor C75 for short. 8. Check operating grid bias at V20 and V21- should reduce from -140 V key up to -52 volts key down. 9. Check R96, R89, and R90 for proper resistance readings. 10. Check coil L19 and L20 lugs for grounding to coil enclosure. 11. Blown or defective loading capacitors. Check C154, C155, and C156. 12. Rear wafer of bandswitch has rotor improperly positioned. Remove and reposition.
Unable to neutralize Final Amplifier.	1. Lack of Final grid current - retune previous Heterodyne Oscillator, Mixer, VFO mixer, and Driver stages for proper levels. 2. Check for wiring error to neutralizing capacitor C58 - coaxial cable routed as shown must be used. 3. Check for proper C58 stator connection to Final Tank Circuit.

DIFFICULTY	POSSIBLE CAUSE
Unable to null the carrier.	1. Carrier oscillator not set at proper point on sideband filter slope - reset carrier oscillator. Check C80 wiring. 2. Check polarity of CR1 and CR2. 3. Check for wiring or resistance error of R118, R9, R10. 4. Check for wiring error of C9 and C9A. 5. Check for short from crystal FL1 input connections to ground. (Crystal pins themselves show low resistance to ground normally.)
Unable to set carrier oscillator frequency.	1. Check wiring to C80 and V2A grid. 2. Check for proper installation of Y1.
Unable to set sideband frequency.	1. Check wiring to MS4, C91, and Y3. 2. Check for proper installation of Y3 and Y2. 3. Check wiring to V4 grid circuits.
Unable to set sideband balance.	1. Check wiring to R117 and V4 cathodes. 2. Check R117 resistance reading with respect to its center arm.
Unable to set ALC Meter level.	1. Check resistance of and wiring to R113. 2. Check wiring of R22 and cathode connections at V3. 3. Check wiring of MS1R.
Unable to set FSK frequency.	1. Check wiring to C92 and grid of V4. 2. Check wiring to MS4 3. Check wiring to FSK KEY jack. 4. Follow and recheck instructions on "Setting FSK Frequency."

SERVICE INFORMATION

SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit model number and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed equipment to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a minimal service fee, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service for your HEATHKIT equipment. Although charges for local service are generally somewhat higher than for factory service, the amount of increase is usually offset by the transportation charge you would pay if you elected to return your kit to the Heath Company.

HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally, improper operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the type and model number of kit in which it is used.

C. Mention date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

In the event that your instrument must be returned for service, these instructions should be carefully followed.

Be sure all tubes and crystals are installed in their respective sockets. The Transmitter should be completely mounted in its cabinet. Place packing material around the four regulator tubes as well as around the top and sides of the 5U4 and 5R4 rectifiers to prevent breakage in shipment. Include all cables used with the unit.

Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY
Benton Harbor, Michigan

ATTACH A LETTER TO THE OUTSIDE OF THE CARTON BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Also, include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by insured parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY